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AUGUST 1961 / 50c

AIR FORCE

and SPACE DIGEST

The Magazine of Aerospace Power / Published by the Air Force Association

That Moscow Air Show...

MANNED AIRCRAFT AREN'T 'OBSOLETE' IN RUSSIA ★★★

RESCUE

The Kaman HUSKIE was designed to be a rugged, reliable rescue helicopter. It was bred for the boondocks. The number, nature and difficulty of the rescues it has completed since entering operational service prove it was bred right. Rescues involving Kaman helicopters which hit the headlines recently follow below, with on the spot photos to the right.

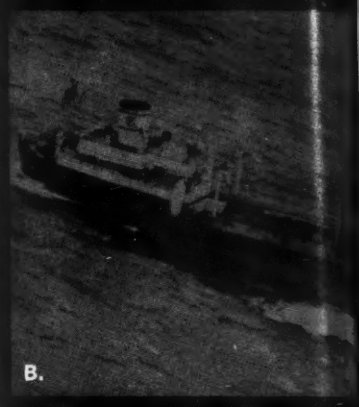
A. LARSON AFB, WASH.— A Huskie hovering over the burning wreckage of a B-52D used its rotor downwash to keep flames away from the bomber's 128,000 pound fuel load until all 10 crewmen had been safely evacuated. (Air Force Photo)

B. CAPE HATTERAS, VA.— When the tanker Pine Ridge broke up off shore, a Kaman HUK operating from the Valley Forge rescued 9 crew members and returned them safely to its carrier base. (U.S. Coast Guard Photo)

C. RANDOLPH AFB, TEXAS USAF H-43 on standby alert reached the crash scene of a KC-97 tanker and worked with fire fighting crew to prevent flames from spreading to 4,000 gals. of spilled fuel, saving the aircraft. (San Antonio Field Photo)

THE KAMAN AIRCRAFT CORP., BLOOMFIELD, CONN.

A.


B.

C.

In national defense
KAMAN is a part of the rescue plan

This demonstration photo became a reality at PLATTSBURG, N.Y., when one of the crewmen who bailed out of a crippled B-52 was injured when landing in an isolated area of 100 foot trees. The crew of a Huskie saved his life by hovering over the spot and lowering a medic to give first aid until rescuers on foot reached the scene.

GOODYEAR

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GOODYEAR AIRCRAFT CORPORATION

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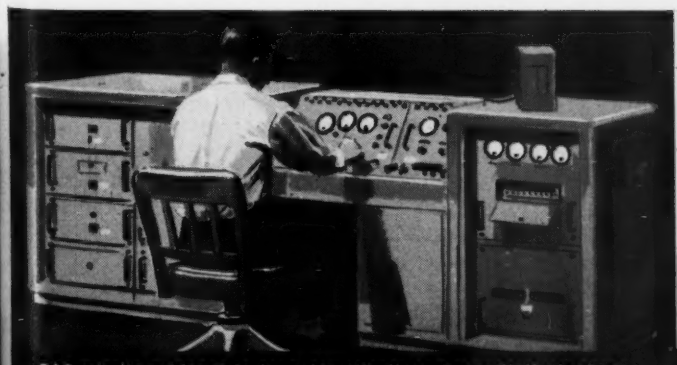

GAC missile guidance tester automatically and quantitatively checks complete Air Force Mace guidance system.

GAC telemetry system tester checks out airborne telemetry package for Navy's SUBROC missile.

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and SPACE DIGEST

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—Sovfoto

The parallel is so obvious that it is like reliving a nightmare. In the early '30s, Hitler was calling for general disarmament while at the same time building what he hoped would be his invincible war machine. Today, Nikita Khrushchev, an old man in a hurry, does the same. It seems only yesterday that we watched the bully boys of the Third Reich advertising their vaunted Luftwaffe. Now we are treated to the Moscow air show (*see Editorial, page 4, and Photo Report, page 23*). But history never repeats itself exactly. The concept of collective security, born in the crucible of World War II after the tragedy of prewar appeasement, has survived despite the severe tests of western pluralism. And although it is true that the possibility of nuclear war adds awesome factors to the equations of peace and war, this works several ways—not all of them to the advantage of Khrushchev. The Soviet boss surely contemplates the possibility that the riper fruits of his country's "socialism" must be a sore temptation to his Chinese Communist comrades. Khrushchev, better than anyone, must recall that Hitler, claiming to fight Bolshevism, opened the gates of Europe to his supposed enemy. Khrushchev, in what he calls the struggle with capitalism, must know the risks involved in upsetting the balance of power, not only between his empire and the West, but between Russia and Red China.

Although it never repeats itself exactly, history always exacts a price. Divided Germany today is paying for Hitler's madness yesterday. We ourselves are paying in 1961 for not taking the risks during the Hungarian ordeal in 1956 which we are willing to take today. Khrushchev, too, is not exempt from the rules of the game.—W.L.

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Tragedy's agent was a Sidewinder. The missile got loose from an Air Guard F-100 during the practice intercept of a SAC B-52 early in April. A veteran aviator-author retraces the details of one of USAF's worst accidents from that moment on.

What's Russia Doing About Civil Defense? / LEON GOURE 38

The answer to the question is "plenty." The Kremlin has devoted major attention to the subject for some years. A vast number of Russians have received CD training.

Flight Line for the Future / J. S. BUTZ, JR. 42

America will achieve many of the objectives of its moon program in the decade ahead. The nation's first "spaceships" will be the vehicles that carry US men and hardware up, up, up.

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USAF's B-58 Hustler bomber is one of the world's most advanced strategic strike aircraft. A busy training program and a series of record flights have kept planes and SAC crews on the go in recent months.

SPACE DIGEST

We're Going to the Moon . . . Does the Public Know Why? / TREVOR GARDNER 55

The urgency and implications of President Kennedy's call for a national commitment to place an American on the moon are *not* fully understood by the general public, warns a noted pioneer and prophet of the space age.

Biology's Stake in Astronautics / AARON NOVICK and JOSHUA LEDERBERG 65

Two distinguished scientists point out that biology could gain more from space exploration than any other major field of science, especially in terms of new understanding of the origin and nature of life.

Spaceman's Best Friend—the Chimp / FRANK GIUSTI 72

Close cousins to man, the chimpanzees at the Air Force's Aeromedical Field Laboratory at Holloman AFB, N. M., are supplying vital data to the stockpile of bioastronautical know-how needed to ensure man's safety in purposeful spaceflight.

Speaking of Space / WILLIAM LEAVITT 80

In the enthusiasm to build new facilities for the commendably accelerated national space effort, are we overlooking existing capabilities and courting the danger of diffusing our available talent?

20 Years of Partnership / MAJ. ROBERT SPENCE, USAF 89

USAF and the British Royal Air Force have now been flying as aerospace brothers in arms for two decades of war, peace, cold war, near war. The arrangement has been a winging success in human terms as well as in terms of free-world security.

In Memoriam: Our Honored Dead 92

A report on the Books of Remembrance commemorating the British and American airmen killed in World War II. The memorial, enshrined in the rebuilt St. Clement Danes Church, London, is a testimony to the years of USAF-RAF cooperation.

Trophy Night at the Academy / A PHOTO FEATURE 98

The young Air Force Academy graduated its third class on June 7. One of the features of June Week preceding Commencement was a glittering AFA Honor Squadron Dinner.

That Moscow Air Show . . .

HERE WE GO AGAIN

John F. Loosbrock
EDITOR, AIR FORCE/SPACE DIGEST

IT WAS only six years ago that an air parade of advanced Soviet bombers and fighters over Moscow shocked the free world. We couldn't understand then why anyone should have been surprised, and we can't understand why anyone should be surprised today at the latest display of military might and technological competence displayed recently at Tushino.

At least the record is a clean one. The Soviets have been consistently underrated on every major military development since the end of World War II. This latest indication that they have a bewildering variety of baskets for an awesome number of eggs is one more to add to the list.

And the list is a long one. It was said the Soviets would take five to seven years to copy the B-29 they interned during the war. It took two. Then it was said they couldn't build jets, or atomic bombs, or hydrogen bombs—and if they did build the bombs they couldn't deliver them. And so on and on—to Sputnik and Yuri Gagarin.

Why Americans continue to kid themselves about Soviet intentions and capabilities is getting to be more of a matter for a psychiatrist than for a military commentator. One of the basic reasons appears to be the fixed belief that Americans can do anything better than anybody else, especially making things. We hate to admit that we can be out-researched, outproduced, or outstripped in any way—particularly by a system of government and economics that is diametrically opposed to our own.

Another reason is that we just haven't wanted to spend the kind of money that it takes to keep pace in the kind of across-the-board competition that the Soviets seem to be able to find the resources for.

A third reason is our national predilection for seeking simple, easy answers to essentially complicated and expensive questions. We don't want to have to do this *plus* this *plus* this. We like the either/or approach better—men *or* machines, aircraft *or* missiles, big wars *or* little ones.

Well, it ought to be pretty clear by now that the Soviets are willing to go for broke, to push themselves to excellence in every meaningful element of national power and to exploit that power in the nakedest way in international competition—even if this does mean short rations on the home front and a postponement of a few consumer comforts.

It's not an easy time, if it ever was, to be a planner in the Pentagon. Looking to the immediate future, we will soon be pitting a numerically shrinking bomber force against improving Soviet defenses, and we are hastening the process by the premature phasing out of the B-47 units without providing B-52s and B-58s in adequate numbers to replace them. All this before the missile portion of our mixed force is sufficient, in terms both of numbers and reliability, to take up the slack. At the same time, our defenses face the same kind of mixed threat that we always said would present a problem to the Russians—ICBMs, air-launched missiles, supersonic bombers. And, while current discussions center on an accelerated B-70 program, or more B-52s or B-58s, it may well be the judgment of history that the cancellation of the F-108 long-range interceptor and the failure to modernize the DEW Line were the biggest past mistakes of all.

To remind us that this weighing of military pros and cons has long since ceased to be an academic exercise we have only to consider the forthcoming test of will and strength over Berlin.

Mr. McNamara said only recently that "currently we are as strong—if not stronger—than any aggressor." This is a significant admission, whether taken in the context of military strength in which it was offered or in the context of strength of will and determination. It's the first official pronouncement that we can recall that admitted the possibility that we were not indeed stronger at the present point in time.

Berlin is a test, not only of ability, but of credibility. The Soviet's belief about what we *will* do is as important as their belief about what we *can* do. In that context, we can't believe that "as strong" can ever be strong enough.

The Berlin crisis is taking us to the edge of the precipice. If it is resolved short of war we will still be teetering on the edge of the chasm. Nonwar is not to be confused with peace, and there will be other Berlins.

As Secretary of the Air Force Zuckert put it recently, we must be prepared to face the problem "for as many years, for as many changes of Administration, for as many decades, for as many generations, as may be necessary to bring man to his senses."

Surely, now is the time to put aside business as usual, to get the country on what Secretary Zuckert calls "a very long period of national alert," to press home to all the people the sense of urgency which we heard about so much during the recent presidential campaign. Before we can convince the Soviets that we mean business—not only in Berlin but on every point of principle where we oppose them—don't we ourselves have to be convinced?—END

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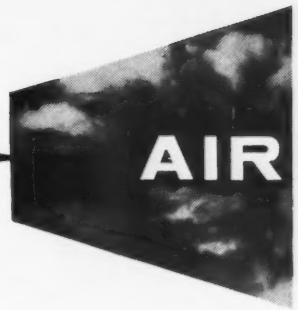

Death of a Guardsman

Gentlemen: I would like to take this opportunity to express my sincere gratitude to all of my late husband's many friends and associates in the Air Force Association for their kind expressions of sympathy in my hour of need. The cards, flowers, and other expressions of sympathy were a great consolation to myself and the children and a fine tribute to a man whose life was devoted to airpower.

Mrs. David F. McCallister
Swarthmore, Pa.

Gentlemen: To say that Dave McCallister's legions of friends were shaken by his death is to indulge in gross understatement. May I offer these few jottings in his memory—a memorial to a man of enormous energy who did so much so well.

* * *

I knew "Snapper" first in '51 as a serious student of jet instrument flight, a technical perfectionist, and a skillful translator of the mechanical reaction into words the embryo jet jockey could comprehend.

I knew him, from a distance, as the CO of the 142d Tactical Fighter Squadron, Delaware Air National Guard, an enthusiastic flying leader who made sure "his boys" were always in the running for the Spaatz Trophy.

I knew him as the effervescent proponent of a water-squeezer jet safety barrier—an important device now under Air Force study.

I knew him as McSnapper, caterer, canner of McCallister's International Turtle Soup, and as inventor of a flight calculator, the "Soup-Cutter."

I knew him as Davey Mac, the writer, and it was our private joke that we wrote so good and sold so little. His typewriter with the green ribbon was part of his flying gear, but even his romantic leading lady talked like a jet jock.

I knew him as a proud father, beaming as he spoke of his eternal bride, Cindy, and the brood.

I knew him as a dedicated disciple of day-to-day flying safety who wore the slogan "Fly Safely with the 142d" embroidered on his orange flying suit wherever he went. Dave would have turned his skin inside out if it would have prevented an accident.

I knew him as a true believer in the jet fighter who battled for integration of the Century-series fighter into the Air National Guard program—yet, who came to accept ultimate conversion of his unit to C-97s. It is an ironic twist of fate that a T-33, perhaps the simplest jet of them all, snuffed out his life the only way it could—an engine failure on takeoff.

I knew him, finally, as a friend.

I mourn for Snapper.

John Pope
Arlington, Va.

Common-sense Approach

Gentlemen: Permit me to congratulate you upon your June editorial "Protecting Presidential Prestige." It is excellent.

I, personally, do not believe in a trial-and-error philosophy, unless it be employed in laboratories. Common sense, based upon mathematical deduction, is the only sure-fire solution to any problem.

Let highly qualified civilians be responsible for diplomatic, financial, legal, engineering, production, and contract administration problems. But insist that the military alone be asked for military opinions and military action.

The President, elected by the majority of the people to represent all the people, is the deciding factor in all matters pertaining to the life and well-being of the USA. That is his responsibility.

And we, the people, are duty-bound to support the President, through our Congress.

Albert Jason
Oakland, Calif.

Man-Machine Age

Gentlemen: Dr. Ramo's article ["Intellectronics – Education's Newest Frontier," April '61] is very enlightening, but I feel that one further step is required to complete the picture of man's potential use for machines. The periphery of this capability was skirted in the paragraphs "Extending Human Brains by Machine" and "Man-Machine Partnership in Education," and is as follows:

The human brain is only used to about fifteen percent of its functional capability. In all probability, use of the remaining eighty-five percent of the brain depends on the information which is fed into it by the senses. As yet there appears to be no way to develop the educational capabilities of this additional gray matter. Why not program the machines to educate man? Here would be positive control of the man-machine complex with man ultimately in the driver's seat.

Although I've never seen it referred to, I would guess that the development of the unused portions of man's brain would result in an exponential increase in his intellect rather than geometric. If the "giant brains" are here to stay, let's think of using them to develop man's potential intellect.

Capt. Robert M. Allman
Scott AFB, Ill.

Accuracy Is the Word

Gentlemen: What one word should be associated *with any* phase of any safety program? Direct this question to any of the safety-conscious personnel of the Air Force and I believe you would receive an almost unanimous answer—accuracy. Categorically: accuracy of investigation, accuracy of analysis, and accuracy of reporting.

With the latter thought in mind, I would like to correct the erroneous impression given by the photograph and its descriptive story at the bottom of page 111 in your May issue.

But first, let me inject a rule of thumb, which is: "Intent to fly." This is a general rule of thumb that is applied to any given accident as an aid in determining whether the accident is a ground accident or a flying accident.

The photograph *(page 111)* is truly that of a ground accident, in which a Boeing KC-135 and a "nose dock" blew up and burned during a fuel-cell repair job.

The story under the picture refers to a KC-135 that ". . . unexpectedly went out of control. . . ." The particular loss of control referred to happened after power had been applied to the

(Continued on following page)

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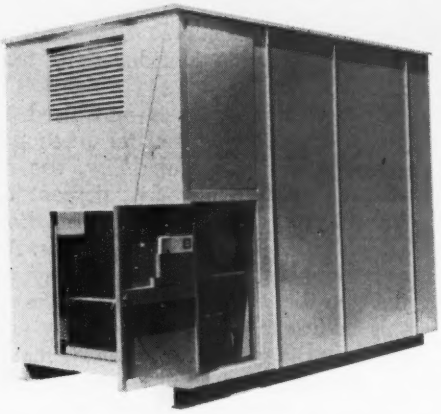

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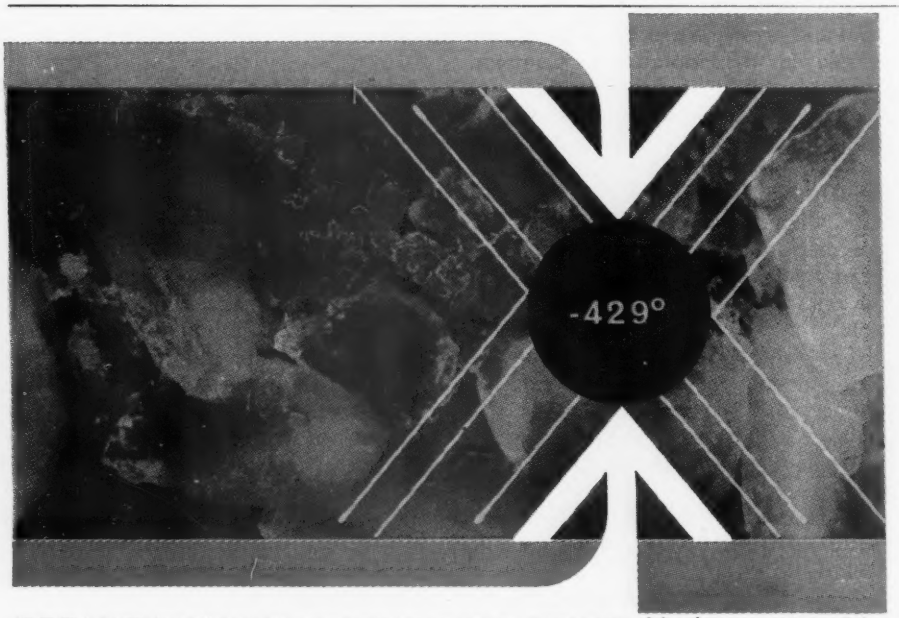

BREAKTHROUGHS ON THE COLD FRONT. Under contract to the Air Force and NASA, our scientists are making major advances in cryogenics. They're now studying (1) evaporation of liquid hydrogen and liquid oxygen to pressurize cryogenic propellant tanks, (2) effects of aerodynamic heating on liquid hydrogen propellant systems, and (3) effects of bombarding materials with neutron and gamma radiation at temperatures down to −429°.

LOCKHEED/GEORGIA

Marietta, Georgia

aircraft for takeoff (intent to fly). Therefore, the loss of directional control, the accident, and the resultant destruction—all of it—a flying accident. Sirs, the photograph and story as published are not allied.

Capt. Leland C. Pyle
Atwater, Calif.

● *Reader Pyle scores high in accuracy of analysis. We piled one up. Cause of accident: Editor's error.*—THE EDITORS

Recruiter

Gentlemen: Re your article "Persuaders in Blue" [May '61 issue], I think Colonel Glines did an outstanding job of explaining the functions of an Air Force recruiter. However, I think that Joe Lingle's story isn't complete. It doesn't tell of the extra money it takes Joe to keep that uniform in razor-edge condition, or the cost of those cups of coffee and meals while away on these flag stops. Also, Joe can forget about promotions while serving his four years on recruiting. I refer to my detachment of forty-five recruiters and two promotions in two years. Basically, Joe is "Mr. Air Force" in any city or town, and also the poorest citizen there.

SSgt. Neno Sartini
Norristown, Pa.

Crew of *Mi Amigo*

Gentlemen: I am engaged in writing an article for our local newspaper about ten US airmen who, aboard a B-17, crashed and died here in Sheffield's Endcliffe Park on February 22, 1944. The airplane, dubbed *Mi Amigo*, was part of the 364th Bomb Squadron, 305th Bomb Group, and flew from Chelveston US Air Base, England, on Mission 295 over Denmark.

Personnel were: 1st Lt. John G. Kriegshauser, pilot; 2d Lt. Lyle T. Curtis, copilot; 2d Lt. Melchor Hernandez, bombardier; 2d Lt. John W. Humphrey, navigator; SSgt. Robert E. Mayfield, radio operator; SSgt. Harry W. Estabrooks, engineer; Sgt. George M. Williams, gunner; Sgt. Charles H. Tuttle, gunner; Sgt. Maurice D. Robbins, gunner; Sgt. Victor R. Ambrosio, gunner.

I am anxious to learn as much as possible of individual crew members, Mission 295, and especially, details of the *Mi Amigo's* reported contact near target with enemy aircraft.

I hope that readers of AIR FORCE/SPACE DIGEST can help me gather this information.

Frank R. Long
366 Langsett Rd.
Sheffield 6, England

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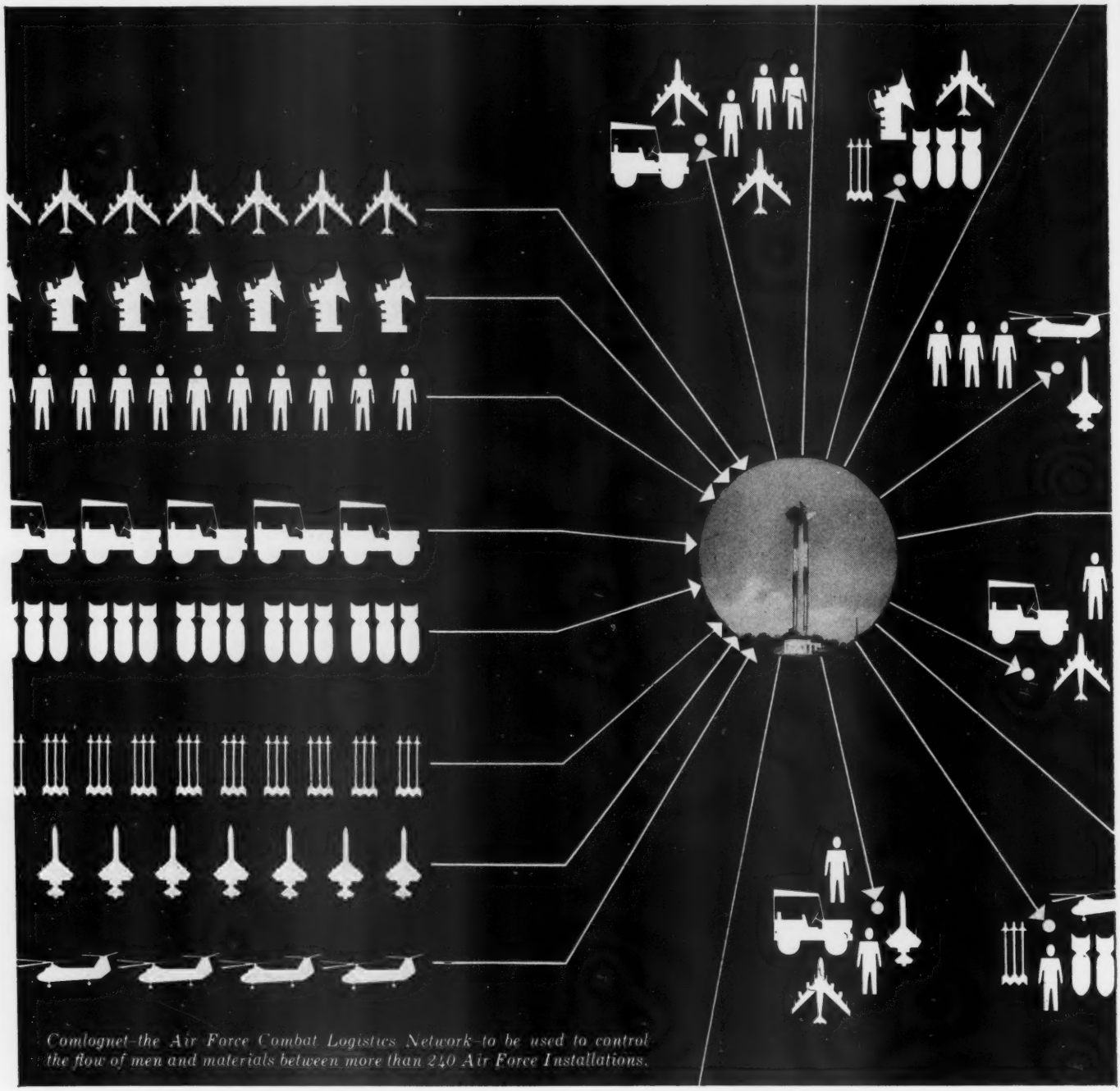

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WESTERN UNION...*finds better ways to speed it electronically*

What's New With ★ RED AIRPOWER

Here's a summary of the latest available information on Soviet air intelligence. Because of the nature of this material, we are not able to disclose our sources, nor document the information beyond assurance that the sources are trustworthy.

Soviet Russia recently overhauled its entire scientific and technological structure. This was a top-priority matter among the men who run the Soviet Union and occasioned wide interest among Soviet experts on this side of the Iron Curtain. The Communist and free-world press alike gave it major play.

Soviet newspapers announced that the State Scientific and Technical Committee, with its loose rein over technology, was abolished. Complete control over all scientific and technical activity was passed to the State Committee on Coordination of Research and Development. This new group was given much more power than the USSR Academy of Sciences or any other organization ever enjoyed.

As usual, the decree by the Central Committee of the Communist Party, which dictated the new setup, was accompanied by a denunciation of past shortcomings. The primary target was the Academy of Sciences.

Various explanations for the Soviet move were offered in US publications. It was interpreted as a downgrading of the Academy of Sciences, a reflection of "growing dissatisfaction with scientific efficiency and the delay in translating technology into production goods," the creation of "a superagency to further exploit Soviet space successes," a move to free the Academy of Sciences for more concentrated efforts in pure science so that "a serious attempt could be made to match the ingenuity and imagination of the American space program," and as a move dictated primarily by the rapid expansion of the Soviet research and development establishment during the last five years, when the number of professional personnel almost doubled and dozens of new agencies were created.

Contradictory as these statements might seem, all of the deficiencies and sources of difficulty which have been cited undoubtedly exist in some degree. However, another explanation of the Soviet reorganization seems reasonable considering the evidence at hand.

Two situations point to the conclusion that the change was prompted by political considerations as much as technical necessity. First, Mikhail V. Krunichev was placed in charge of the new research committee. He died shortly after assuming the post but his appointment set the tone of the new organization's operation. Krunichev was an industrial manager with a record as a secret policeman dating back to the early '20s.

The second evidence of political influence is the fact that the top leadership of the Communist Party regains a large portion of the centralized control over industry and R&D that it gave up in 1957 to regional Party groups. In addition, this ends the vigorous activity of the Republics of the Soviet Union in setting up independent Academies of Science. Even though the Republic academies are subordinate to the USSR Academy, they have more or less been going their own way while pressing central authorities for financial aid.

Krunichev's presence as the boss of the new research-and-development agency undoubtedly served to temper objections to the new scheme. Secret policemen, or former secret policemen, may not hold the power in today's Russia that they did in yesteryear. But Krunichev without question was a man with both a personal following and an impressive Party reputation.

In his younger days, after several years of the usual secret police work, Krunichev was given a good technical education. Theoretically, this enabled him to control technical planning and to apprise the Party of the technical and political reliability of top scientists and engineers.

Krunichev got out of school in 1932. He rose in the Party hierarchy during a period of extreme personal danger. The great purges of the late 1930s wiped out thousands of the Party faithful—technicians, high-ranking military officers, and especially people with secret police backgrounds. A struggle for power raged in the secret police organization. Party leaders who didn't ally themselves closely with Stalin didn't make it through this period.

Krunichev rose to be the Deputy Commissar of the Aircraft Industry shortly after the purges began. He kept this job for several years and then received more important appointments from Stalin. The purges almost took the Russian aircraft industry out of business just before the Finnish War in 1939. A sizable group of designers died. Tupelov, the most respected, was arrested for many months.

When this irrational period passed, Krunichev also played a part in the resurgence of the industry to meet the challenge of World War II.

However, the use of Party ramrods such as Krunichev apparently did not let up in critical industries until Khrushchev's de-Stalinization speech in 1956. At that time Khrushchev had defeated the Malenkov faction which advocated more consumer production at the expense of heavy industry. Khrushchev believed that the temper of the people could be improved just as much by a relaxation of strong central control and a relaxation of government attitudes all along the line. Many top Communists disagreed with him on this point. But he went ahead with wide decentralization of industry. This included part of the armaments industry. Aircraft production plants were placed under regional control. Design collectives remained under the central authorities.

In a number of ways, including the case of artists and writers, who have felt the strong hand of government more of late, Khrushchev found that he could not live up to his original promises for a "new liberalism." So it is now on the industrial front.

The move to centralize R&D now repeals most of the industrial liberalism declared in 1957.

Appointed research czar after Krunichev's death was Konstantin N. Rudnev, a prominent engineer and industrial manager who has headed the State Committee on Armaments Engineering since 1958. The other members of his all-powerful committee are all top technical people. Most are engineers. Most have armaments industry backgrounds.

It may be that this is the key point about the top-level Soviet research-and-development organization in the struggle for supremacy in the space age. It is run by engineers while the US effort is controlled by scientists.—END

Product of a Year's Research . . . . .

ALL ACCIDENT INSURANCE REPLACES TRAVEL-ACCIDENT COVERAGE - AT LOWER COST

Current Policyholders Protected Under Present Plan until Policy Expiration Date

By Richmond M. Keeney
Insurance Director, AFA

AFA'S insurance programs have long had a twofold objective—to provide Air Force Association members and their families the greatest possible protection against the hazards of daily life, and to provide this protection in the simplest possible form at very low cost.

We keep all of our programs under constant review, testing them against these objectives, revising and improving them whenever possible.

The new all-purpose accident policy announced at the right is an example of this review program.

It includes all of the previous benefits of AFA Travel-Accident Insurance, adds many new ones in a more convenient package, and is available for 20% to 40% *less* per thousand dollars of coverage than the old plan.

The new plan covers *all* accidents, not just travel-accidents. Coverage as a passenger on *all* military aircraft (not just MATS) is included in the basic price of the policy. And policyholders now have their choice of (1) a *complete family* plan, including coverage for their wife and children, or (2) the individual plan, for themselves only.

Whichever plan a member chooses, the amount of coverage will be increased by 5% of the basic amount each year, up to a maximum of 25%, for each of the first five years of coverage.

For the sake of simplicity and economy (remember that this increased coverage costs *less* per thousand dollars than the limited coverage of the old policy), the new all-purpose Accident Insurance will be available in units of $5,000, up to a maximum of $50,000, in both the Family Plan and Individual Plan.

For the same reasons, AFA members who now have Travel-Accident Insurance will continue to be covered under their present policies until these expire. At that time they will automatically receive full information about the new plan as well as a conversion application for coverage under the new program. This will eliminate the costly administrative problem of short-rate cancellations and/or reissue of policies for a brief period. Members who do not now have Travel-Accident Policies may apply for the new coverage immediately.

With the expansion of this program to cover *all* accidents, we believe that AFA's Shield of Insurance Protection for members—Group Life Insurance, Flight Pay Insurance, and All-Purpose Accident Insurance—is unequaled by any other service organization.

AFA'S NEW ACCIDENT PROTECTION PLAN COVERS YOU AND YOUR FAMILY AGAINST ANY ACCIDENT...ANYWHERE...ANY TIME

AFA Accident Insurance has a new name, new benefits, a new purpose. Now, it's AFA All-Accident Insurance, a policy that covers you . . . or you and your family . . . against all accidents.

YOU GET ALL OF THESE OUTSTANDING BENEFITS

Complete, All-Inclusive Protection

You and your family are completely insured whether you are traveling, at home, on duty or off duty. You get full, 24-hour protection anywhere in the world, for any kind of accident. You are even covered, *at no extra cost*, as a passenger in *any* military aircraft.

Your Choice of Family Plan or Individual Coverage

If you choose the new Family Plan, you and your entire family are insured under one policy. Your wife is insured for 50% of your coverage, and each child (regardless of number) is insured for 10% of your coverage. For example:

Your Coverage	Wife	Each Child
$15,000	$7,500	$1,500

If you choose the individual plan, of course, only you are insured.

Automatically Increasing Benefits

Under both the Family and Individual Plans, *benefits automatically increase* by 5% each year you renew for up to 5 years, yet you pay only for the basic amount of insurance. For example:

	Your Coverage	Wife	Each Child
Basic Amount	$15,000	$7,500	$1,500
After 5 Years	$18,750	$9,375	$1,875

Dismemberment Benefits

In addition to the normal death benefit, your policy also provides full protection against accidental loss of limbs or sight. If you were to lose an eye, arm, or leg, you would receive 50% of the face amount of your policy; if you were to lose two or more limbs (and/or the sight of both eyes) you would immediately receive the *full face value* of your policy.

Medical Expenses—up to $500!

An extra benefit—to protect you from non-reimbursed, out-of-pocket medical expenses which are in excess of a deductible amount of $50. For any accident you incur, regardless of the face value of your coverage, $500 is immediately put aside for your benefit. If you incur any medical expenses above the deductible amount all or any part of this money is swiftly made available to you.

Limits of Coverage

Coverage is available to all adults in amounts ranging from a minimum of $5,000 to a maximum of $50,000. Coverage for member's wife and children under the Family Plan is automatically set at 50% of face value of member's policy for the wife and 10% for each child.

Limits of Liability

The Insurer's Aggregate Limit of Liability with respect to all insured persons holding certificates issued under this master policy while in any one aircraft shall not exceed $500,000. Should the total of the individual limits of liability with respect to such insured persons while in any one aircraft exceed $500,000, then the amount applicable to each insured person shall be proportionately reduced to effect a proportionate distribution of the said aggregate limit.

MAIL YOUR APPLICATION TO AFA TODAY!

(AFA members now holding travel-accident policies will be covered under their current policies until policy expiration dates, at which time they will automatically receive applications to extend their coverage to the new AFA All-Purpose Accident Insurance.)

AFA ALL-PURPOSE ACCIDENT INSURANCE

(UNDERWRITTEN BY MUTUAL OF OMAHA)

Name _____

Address _____

City _____ *Zone* _____ *State* _____

*Beneficiary** _____ *Relationship* _____

**Under the family plan, the beneficiary for all family members will be the above named AFA member. A beneficiary should be named, however, for the above named AFA member.*

☐ *I am an AFA member* ☐ *I enclose $6 for AFA membership*

Application must be accompanied by check or money order. Send remittance to: Insurance Division, AFA, 1901 Pennsylvania Ave., N.W., Washington 6, D. C.

Basic Amount	Family Plan†	Individual Plan
$ 5,000	☐ $ 9.50	☐ $ 6.00
$10,000	☐ $19.00	☐ $12.00
$15,000	☐ $28.50	☐ $18.00
$20,000	☐ $38.00	☐ $24.00
$25,000	☐ $47.50	☐ $30.00
$30,000	☐ $57.00	☐ $36.00
$35,000	☐ $66.50	☐ $42.00
$40,000	☐ $76.00	☐ $48.00
$45,000	☐ $85.50	☐ $54.00
$50,000	☐ $95.00	☐ $60.00

† Family plan includes 50% of basic amount for wife and 10% of basic amount for all children, regardless of number.

AIRPOWER in the news

Claude Witze
SENIOR EDITOR, AIR FORCE MAGAZINE

Days of Decision

WASHINGTON, D. C.

Deadlines are inexorable things, and this one finds us going to press on the eve of momentous decisions. National security, which in 1961 means airpower, is an important topic of discussion as the effect is noted of other decisions, made a few years ago. One Senate committee, with budgetary responsibility, is standing by for the Pentagon to communicate with the White House and for the White House to communicate with the people. Another has plans for an inquiry into the mixed-force concept and what we are doing to keep the mix adequate. A third, Henry M. Jackson's Subcommittee on National Policy Machinery, isn't going to help us through the next six months, but it certainly has the ambition to improve the record of history when it is written. By early August it will be questioning Secretary of State Dean Rusk, Defense Secretary Robert S. McNamara, Budget Director David Bell, and Defense Comptroller Charles J. Hitch. The aim will be to find out how the government can best staff and organize itself to "outthink, outplan, and outperform world communism." Mr. Jackson says he still is intent on finding out what we do, if anything, toward "timely planning ahead on the critical issues of national survival, and for effective implementation and follow-through of foreign and defense policies."

There is no doubt that the Senator, who is a competent quizmaster in this area, will have plenty of headlines on which to provide background. The current situation, which must be met by the decisions of the next few weeks if not days, is due primarily to the shadow of Berlin. It is growing blacker, and through it the Russians are navigating production models of new supersonic airplanes that have been years in the design and development cycle. They were on the drawing boards and in the laboratories and wind tunnels back when the debate about the future of the manned airplane was getting under way and USAF started its decline from a strength of 137 wings down to the scheduled eighty-four of 1962. So far, there has been no suggestion of weaknesses in our ability to maintain the deterrent or our ability to defend the United States against manned-bomber attack. But even the New York *Times* has sensed "a watering-down of prior claims in this and previous Administrations." Here the reporter could and did cite a statement of Mr. McNamara that "currently we are as strong—if not stronger—than any potential aggressor." This is not as convincing, somehow, as the earlier assertions that we remain the strongest military power in the world. It raises the specter of something that is missing, something that was not spawned a few years ago, like the airplanes paraded by the Reds. At the time of the Suez crisis, you may recall, Moscow rattled rockets and talked about their being in "serial production." This helped to deafen some more ears to the USAF plea for a mixed force in being with basic reliance on a man in a cockpit.

It would be totally unfair to imply that airpower is the only facet of our security posture that is taking attention. Chairman Carl Vinson of the House Armed Services Committee, who never went to Harvard or wrote a book, is "shocked" by the fact that the Army is not up to its authorized strength. On May 31 there were 856,000 men in the Army. Congress, where Mr. Vinson is an important man on military matters, had authorized 870,000 men and plans on 875,000 for next year. If the Army had its way there would be 925,000. Mr. Vinson wrote a letter about this to A. Willis Robertson, the Senator who is acting chairman of the Senate Subcommittee on Defense Appropriations.

"We are faced," he said, "with the cold, hard fact that the Army is well below the strength which, I am sure, both you and I thought it had. And that strength must be further reduced unless some remedial action is promptly taken." The "irony" of the situation, he went on, "is that we find the Army strength declining, principally for money reasons, at the same time we are trying to assure the nation and the world of our firm national resolve to stand firm in Berlin as well as other trouble spots in the world." The only Kennedy Administration reply to the point raised is that any increase in manpower dictated by the Berlin affair will have to come from the Reserve and National Guard and that "that is what the Reserves are for." Well, Mr. Robertson proposes to seek some expert advice on this from Generals Maxwell Taylor, Lyman L. Lemnitzer, and George H. Decker. At the moment, it is likely that mobilization orders will be out before he can get them on the stand. Until then, he will have to rest with the prize-winning words he got from Roswell L. Gilpatric, Deputy Defense Secretary. Senator Robertson asked Mr. Gilpatric whether the United States had an adequate military force to fight "a brush-fire war."

Said the Secretary:

"I think our military establishment today is very strong. If it is not strong enough to meet the threat in Berlin, we are going to come back and ask for some more money."

So far as the Moscow air show was concerned, Mr. Gilpatric said it merely confirmed the Administration's earlier idea that the Russians have not given up their reliance on manned bombers. Nobody said so out loud, but the reaction of the Senate committee to these views was something akin to the idea that they had heard this before. It could have been in the Eisenhower Administration's reaction to Sputnik. There was another survey ordered at that time, too. The one now being awaited probably will not point out that there is no new strategic weapon system under development in this country. Yet this is a fact that takes on new significance in the wake of the Moscow show with its three new and big supersonic planes. If they have been gutted and are flying airframes with none of the components that make them bombers, like the B-70 we can afford under both the Eisenhower and Kennedy Administrations, the Russians did not disclose it at Tushino. Mr. Gilpatric's concept that money can hold the peace in the absence of a force in being with

the stature for the job, he made it clear, has application only in the area of nonnuclear forces. The current study, he said, is concerned only with conventional forces. This neatly avoids the problems of Gen. Lauris Norstad, the NATO military boss, who long has had his strategy worked out on the basis of using nuclear weapons. His conventional forces could do no more than delay a Russian advance once it started. If Mr. Gilpatric can turn dollars into fighting power on the scene before Premier Khrushchev throws out the challenge he will surprise Mr. Vinson, Mr. Robertson, and the Kremlin itself.

On the airpower issue it appears that the Pentagon will stick to its decision to recommend against expenditure of $238 million added to its budget request for long-range bombers by the House. Here it is certain to clash with Congress just as vehemently as it has with Vinson over the number of men in the Army. The House Appropriations Committee has firm ideas about the bomber program, and the Senate hearings were not under way for ten minutes before the Moscow air show, barely forty-eight hours past, was in the record to stay. The decisions to grind the B-52 and B-58 lines to a halt and restrict development of the B-70 system came under fire. The committee worked on from where the House report left off. That group, headed by Rep. George H. Mahon of Texas, said it had considered a number of proposals to stretch out the production of B-52s and B-58s now on order.

"By reducing the number produced per month, and this would increase the cost per plane, production-line operation could be projected beyond the cutoff dates now anticipated," the committee said. "By appropriating sufficiently large additional funds—and should the Administration choose to do so—it would be possible to keep the B-52 and B-58 production lines open indefinitely.

The report then recommended that $448,840,000 be made available for long-range bomber procurement and said first preference in the use of these funds should be given to acceleration of the B-70 program. The Defense Department also would be authorized, if the House committee prevails, to use the money for B-52s or B-58s. When Mr. Gilpatric said that the news of the day—the New York *Times* reported "an impressive show of airpower" from Moscow—would cause no change in Pentagon opinion about bombers, he was scolded at once. Acting Chairman Robertson saw complacency on the scene and pointed out that the original USAF requirements were cut by the Defense Department even before the budget requests went to Congress. Senator John Stennis of Mississippi demanded a reconsideration of the B-70 decision and warned that the risk in this area is more perilous than any other chance we are taking to save money. As the hearing progressed Senators Claire Engle of California, Stuart Symington of Missouri, Ralph W. Yarborough of Texas, Howard W. Cannon of Nevada, John O. Pastore of Rhode Island, and Henry C. Dworshak of Idaho put themselves in the record as favoring one action or another to press on with the bomber.

Both from the House report and the attitude of several senators it is evident that the B-70 program is winning new adherents, some of them persuaded to one degree or another by the news from Moscow, where the aerial parade was preceded by an announcement that the military budget is being increased thirty-three and a third percent. Most of these supporters of the B-70 concept are at a loss to understand why Secretary McNamara, who himself anticipates manned bombers will be needed for at least another decade, is reluctant to speed the project. Buried deep in the sixth volume of the published transcript of the House Appropriations hearings he was pressed on this issue by Rep. John J. Riley of South Carolina. Here is what the Secretary of Defense said:

"We have asked for . . . $220 million for new obligational authority for the B-70 development in fiscal year 1962. . . . At the present time it would be my plan to ask for additional sums in fiscal year 1963. . . . The B-70, however, has many limitations, particularly limitations which will restrict or may restrict its effectiveness in the latter part of this decade and in the first half of the 1970s, which would be the period of its useful life.

"We feel strongly that before spending more money on it we should know more about its capabilities and consider other alternatives. . . . We do not require that plane in our inventory until the latter part of the decade. . . ."

The Secretary did not refer openly here to Soviet defensive capabilities, but the Senate committee, in calling General LeMay to testify, clearly was in a position to ask for some facts on this subject. It failed to do so. A year ago Gen. Thomas D. White, then USAF Chief of Staff, said that Russia has no defense against a Mach 3 bomber operating at the altitudes which will be used by the B-70. He speculated that it would cost the Kremlin $40 billion to meet the threat. If this situation has changed, both Congress and the American people have a right and a need to know it. If it has not changed it will be difficult to justify continued delay on the system.

A final aspect of the present tense and confused atmosphere in Washington is the fact that Mr. McNamara's determination to keep the spotlight on conventional arms and away from the strategic deterrent did not originate with the Chiefs of Staff or his own service secretaries. It came out of a week-end conference at Hyannis Port, Mass., vacation home of President Kennedy. The top guests were Mr. McNamara, Secretary of State Dean Rusk, and Gen. Maxwell Taylor, who has assumed a new position as military consultant to the President. The session was announced as an effort to analyze the Berlin crisis and decide how to meet it. There was no seat on the fantail of the President's private boat for Gen. Lyman L. Lemnitzer, Chairman of the Joint Chiefs of Staff.

Had General Lemnitzer or any of the three service chiefs been present it is highly unlikely they would have favored another major review of military strength. Both the Pentagon and Capitol Hill are vividly conscious of the popularity of the survey since last January. Mr. McNamara has pushed 140 different projects designed to evaluate our defense stature. The Kennedy Administration now is six months old, and the point has been made that it should know enough by this time about our strengths and weaknesses to make decisions when they are needed. Joseph Alsop has suggested that the real agony results from a clash in the Administration between the advocates of a hard line and the advocates of a soft line. Certainly the military services, with the responsibilities they carry, must assume that the hard line will prevail and prepare to back it up. After all, they could have improved this situation with the advice they gave in past years. To take the Russian bomber threat as an obvious example, the North American Air Defense Command (NORAD) has been rebuffed time and again in its effort to build up our missile and interceptor capabilities. Remember the F-108.

It is one of the odd juxtapositions of history that in the midst of this American dilemma, forced upon us by a dictator operating in an era when war is so terrifying a prospect, Ernest Hemingway took himself from the scene in a violent way. William S. White has commented that his death is a loss to our public policy as much as it is to our

(Continued on following page)

literature. Hemingway, White wrote, "remained a staunch force against the creeping pacifism, the ideology-shouting of much of American letters which, unwittingly for the most part, was helping to build up the Communist menace. He remained a man not ashamed of our national power and not afraid to see it used, openly and honorably, against totalitarian aggression everywhere."

Handcuffs on Tomorrow

It is the opinion of the House Appropriations Committee that "the government is moving toward a chaotic condition in its personnel management" because of the increased reliance on outside contractors for technical and scientific services. From here it narrowed its focus to nonprofit organizations, then to military research and development, then to the Air Force. Then it was a simple step to light upon Aerospace Corporation as an example and recommend that $5 million be cut from its budget request for fiscal 1962.

For the record, the House committee report leaned on this reasoning:

"These nonprofit organizations contract either entirely or almost entirely with the federal government. The employees of such organizations are paid indirectly by the taxpayers to the same extent as employees under civil service are paid directly by the taxpayers. The pertinent major difference is that their pay is higher.

"Laws have been enacted by the Congress to regulate salaries of civil-service employees. No such laws protect the taxpayers from the payment of excessive salaries to employees of nonprofit organizations with government contracts. To a considerable extent the use of contracts with nonprofit organizations is merely a subterfuge to avoid the restrictions of civil-service salary scales. The committee considered the adoption of a limitation which would prohibit the payment of salaries in these organizations substantially in excess of applicable federal pay rates. However, it was felt that such drastic action would bring about delays in vital military programs now under way and create further confusion rather than eliminate it."

The report continued:

"It is noted that the buildup of these organizations has not been accompanied by corresponding reductions in the number of military and civilian personnel on the government payrolls. It would be too much to expect military and civilian personnel to perform all of the scientific and technological work which must be performed in the defense effort without a marked reorientation of the present organization and personnel procedure. However, military and civilian personnel on the payroll should be competent to do the jobs assigned to them or they should be removed from the payroll. When essential management functions are performed by contract personnel, the value of the military and civil-service employees assigned to particular management functions affected is considerably lessened, and this fact should be taken into consideration in the staffing of defense programs."

The committee then offered advice to Congress and an order to the Defense Department:

"It is hoped that the appropriate legislative committees of Congress will pursue their reviews of these problems with which we are confronted with a view toward enactment of corrective legislation. Although of special significance to the Defense Department, the problem involves other areas of government.

"The committee insists that the Secretary of Defense establish and announce a realistic policy with respect to this problem prior to the presentation of the next annual defense estimates. In the absence of any such policy, the committee expects to recommend in the next annual defense appropriation bill that severe restrictions be imposed on these and other similar corporations and organizations."

The report then singled out Aerospace, which is one of more than 350 nonprofit contractors working for the government, and put it in a "special category due to the fact that it was established by request of the Air Force." The committee also rendered a judgment that Aerospace's salaries are excessive, its overhead too high, and that it plans too large a staff.

Apart from the Aerospace budget cut—which was a committee recommendation but not included as part of the bill passed by the House—the important result of having these opinions in the report may be their effect on the over-all space effort. There is serious concern in Aerospace and USAF that the criticisms can have an adverse effect on the company's recruitment effort. More devastating, some observers believe, is the refusal of the Defense Department to speak up for Aerospace's mission. The company needs top talent, competent and objective. The competition for this talent is not in the government. It is in private industry. Roswell Gilpatric, Deputy Secretary of Defense, questioned by the Senate Defense Appropriations Subcommittee, said he would defend Aerospace but would not dispute the budget cut. He said, under examination, that he felt the House committee acted as a result of misinformation about Aerospace salary levels and because it did not fully understand the company's vital role as an engineer-architect to help USAF carry out its assigned mission in the development of new space systems. But the Defense Department did not ask the Senate to reject the House committee recommendation or present any part of a case against the argument that "corrective legislation" is needed, or that a new "realistic policy" is required in the face of a threat of new restrictions in fiscal 1963.

The case for Aerospace was made on the floor of the House by a few congressmen, particularly Rep. Chet Holifield, the California Democrat who chaired the Subcommittee on Military Operations and is credited with fathering the Aerospace concept.

"Specialized nonprofit contract agencies like Aerospace are becoming permanent adjuncts of government," Mr. Holifield told the House. "The swift pace and the revolutionary character of weapon technologies, and the Soviet competition in the technological race are largely responsible. New forms of organization, new concepts of management emerge. The old ways, the customary ways, are not sufficient for the cold-war era."

In the face of Mr. Holifield's alarm, which was shared by Rep. Paul J. Kilday of Texas, there was little concern shown for the possible effect on morale at Aerospace. Congressman H. R. Gross, an Iowa Republican and member of the committee concerned with civil-service matters, was the gadfly in the debate, challenging the salaries paid by Aerospace and suspecting the state of California of having some nefarious interest in its welfare. Mr. Gross offered an amendment to the bill making the $5 million cut mandatory and stipulating that no more than $30,200,000 of the defense budget could go to Aerospace. The amendment was rejected, which speaks well for Mr. Holifield and his supporters, but the vote did not remove the issue.

If, in the future, there is a crisis in space as one now looms in Berlin, our failures again will not be current. They will be the errors we made in 1961 and 1962.—END

He's solving a real estate problem

This AMF engineer's job is determining how best to move big missiles off shore for launching. Should they be floated out horizontally, flooded to an upright position, and then launched? Or, would it be more feasible to barge them out? Might they be moved to or assembled on "Texas Towers," or would a causeway or simply land-fill be the answer?

Behind the project is our shrinking real estate at launching sites, plus the hazards inherent in launching Saturn-sized missiles (and the coming, nuclear-powered missiles) near other installations. Off-shore launching may be the answer.

Feasibility studies of all types are an AMF specialty. What kind of remotely controlled machinery is required to service nuclear-powered aircraft? What kind of habitation could be built on (or under) the surface of the moon? What sort of machines (manned and unmanned) could survey the moon's surface without, for example, falling into a fissure? What is the best way to assemble a space station? All these are problems AMF engineers are presently investigating.

If your problem is the first of its kind, AMF will not, of course, have met it before. But AMF's long experience in accepting totally unique challenges gives it an advantage enjoyed by few other organizations concerned with ground support, launchability and space environment. To get further information write American Machine & Foundry Company, 261 Madison Avenue, New York 16, N. Y.

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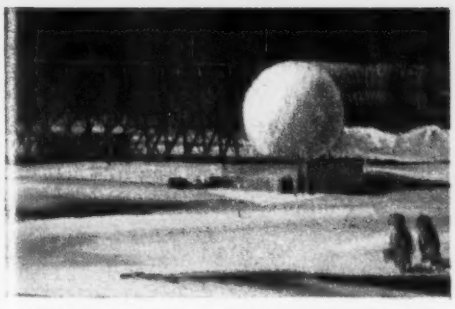
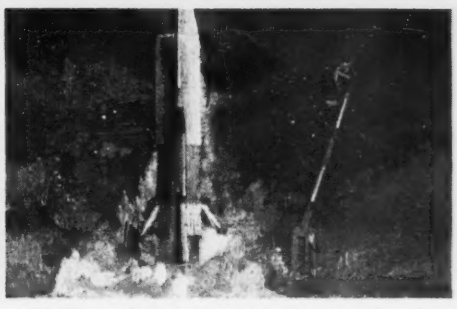
From its vantage point in space, TIROS is sending down to earth new, more definite pictures and data of the world's everchanging weather patterns to aid man in his ageless efforts to control the elements.

Incorporating revolutionary and advanced electronic equipment, TIROS was designed, developed and built by RCA's Astro-Electronics Division for National Aeronautics and Space Administration. Within its small circumference are miniature TV cameras, tape recorders, TV transmitters, command receivers, timing mechanisms, beacons and telemetry equipment. In addition, it carries new scanning and non-scanning Infra-red Sensing Devices, developed by NASA, to measure and record the heat radiation of the earth and its cloud cover, and a revolutionary new Magnetic Orientation Device to capitalize on the effects of the earth's magnetic field and maintain favorable orientation of the satellite for long periods.



BMEWS—RCA Electronics Equipment and Systems contribute to the alert status of the Nation's vast outer perimeter early warning system.

DAMP—at the Caribbean down-range missile testing "slot," the highly complex DAMP vessel is equipped with RCA electronic tracking devices.



ATLAS—an RCA-developed checkout and launch system reduces substantially the "countdown" period required for launching this missile.

RCA developments in miniaturization, reliability, computing and overall electronic activities are contributing to many of the nation's leading space and missile projects. For information describing new RCA scientific developments, write Dept. 434, **Defense Electronic Products,** Radio Corporation of America, Camden, N.J.

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"...firm commitment to a new course of action..."*

Current achievements by the rocket propulsion industry give reassuring evidence of this nation's ability to seize the initiative in the development of large solid propellant boosters. This has special significance in the light of President Kennedy's appeal "for this nation to take a clearly leading role in space achievement."*

Now the industry looks forward to the next significant advance—firing of flight-weight segmented solid propellant rockets of 250,000 and 500,000 pounds thrust at UTC's Development Center.

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P. O. Box 358, Sunnyvale, California

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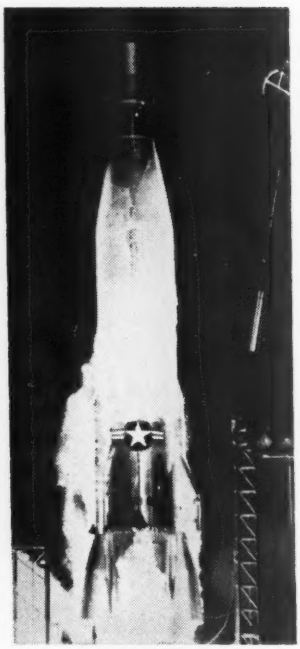
**Excerpts from the special message delivered by President Kennedy before a joint session of Congress, May 25, 1961.*

News,
Views
& Comments

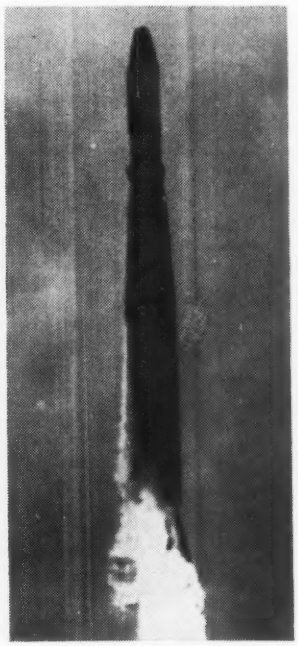
AEROSPACE WORLD

Frederic M. Philips
ASSOCIATE EDITOR, AIR FORCE MAGAZINE



—Wide World Photos, Inc.

Two big blastoffs. Left, Atlas-E leaves the Cape on record 9,050-mile flight to the Indian Ocean on July 7. Right, USAF Discoverer XXVI satellite up and away in shot at Vandenberg AFB, Calif. Satellite's capsule was recovered two days later. Series of Discoverer shots has played important role in over-all US space, research, development.



—United Press International photo

Country A possessed the world's greatest military air armada.

Country B, aggressor to its very soul, was far behind. It turned its full attention, ostensibly, to producing a threatening array of missile and space hardware.

Fearful of the challenge, Country A moved belatedly to develop its own missilry. It spoke officially of the need for a balanced force of missiles and manned aircraft. Yet, in planning and in expenditures, Country A revealed that its main concern was now development of a missile arsenal and defenses against enemy missiles. Country A also yearned for the "normalcy" of lower taxes and a balanced budget. Plans for construction of highly advanced aircraft were slowed or scrapped altogether.

Then, one quiet Sunday afternoon, Country B staged an eye-opening air show of bristling new warplanes. They thundered across the sky of the aggressor capital. In a grandstand, grim-lipped, powerful, arrogant amid this show of strength, stood the leaders of Country B—just as others had stood in other capitals in years gone by.

Incredibly, it seemed that the aggressor state might now have produced a potentially superior manned airfleet to match its apparent missile superiority.

The date of the air show was July 9, 1961, the place Moscow. The Soviet Union celebrated its Aviation Day with an air display that included a whole new family of combat aircraft and impressively powerful new transport helicopters. One of them was a heavy deltawing jet bomber. Another was a deltawing jet fighter with a liquid-fueled rocket booster that gave it breathtaking climb capability. Another was a lighter and smaller jet bomber about the same size as the US B-58. A helicopter, larger than any in USAF use, carried a small house for the crowd. *(See opposite page for a closer look at the Red planes.)*

Chief spectator at the show was Soviet Premier Khrushchev, fresh from a speech the day previous in which he hotted up a new Berlin crisis by announcing sharp boosts in Russian arms spending. The planes overhead lent new accent to his words.

The next move, it appeared, was up to Country A.

☆

For the United States, it was a month in which a USAF Atlas ICBM made the longest missile flight on record, the X-15 edge-of-space plane set a new speed mark, two more Discoverer satellite capsules were recovered from orbit, and the second Ballistic Missile Early Warning System site became operational in defense of the free world. Three Air Force parachutist-skindivers were stars of the show.

★ An advanced Atlas-E fired from Cape Canaveral plopped into the sea 1,000 miles southeast of Capetown, South Africa, on July 7, after a record flight of 9,050 miles. Longest previous shots, only some ten miles shorter in distance, were achieved by two Atlases last year. This latest long-range ride was highly significant. It apparently marked the end of the shaky beginning for the new E. Seven of ten previous test launches for the higher-thrust E had failed, the latest on June 22 at the Cape. The advanced Atlas' three big engines generate a total thrust of 400,000 pounds, 40,000 more than the operational D missile. Atlas-Ds made last year's 9,000-mile-plus distance shots. The July 7 flight reached a peak speed of 17,000 miles an hour, a peak altitude of nearly 1,000 miles, took fifty-three minutes from Florida blastoff to Indian Ocean plunge by the one-and-a-half-ton nose cone.

★ Despite equipment malfunctions that caused him extreme discomfort, USAF Maj. Robert M. White bulleted

(Continued on page 25)

WHAT THAT MOSCOW AIR SHOW SHOWED

The Bounder, a supersonic heavy bomber about 200 feet long and weighing in the neighborhood of 400,000 pounds, was undoubtedly the most important of the ten or more new designs shown during the recent Moscow air show. It appears that the Bounder's basic wing and fuselage could be operated with reasonable efficiency at several Mach numbers, including Mach 3. To achieve its full growth potential Bounder would need a new engine installation and a high temperature structure.

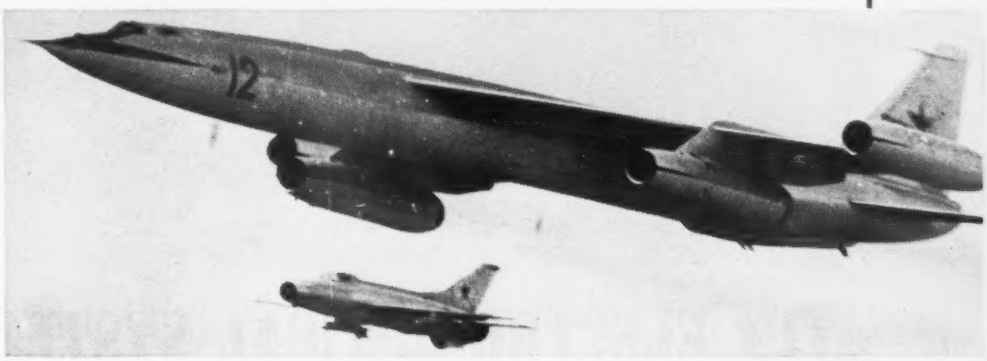
The four engines on the Bounder version shown in Moscow appeared to be in the 30,000- to 40,000-pound-thrust range at maximum power. It was impossible to tell if they were turbofan-type engines. Russian photographs (at right) indicated that the engine inlets did not have variable geometry, at least of the usual Soviet type, so that the top speed of this configuration probably is Mach 1.7 or less. The aircraft's size would allow it to cruise at low supersonic speeds over medium ranges. In addition to various military uses, the Bounder displayed at the air show clearly could be modified into a supersonic transport and allow the Soviets to claim a major aviation first. Commercially, however, it would leave as much to be desired as the subsonic TU-104 airliner does in its speed range. The first Bounder is believed to have flown three years ago (*see* AIR FORCE, *January '60*).

Two other new supersonic bombers took part in the Moscow flyby. One type, with a Caravelle-type rear engine installation, appeared in a formation of ten aircraft. The other apparently is an improved version of the Backfin, first seen in 1957.

At least three new types of deltawing fighters, one equipped with an auxiliary rocket engine, participated in the show. Two new turbine helicopters and a large convertiplane were also shown. —J. S. BUTZ, JR.

—Sovfoto

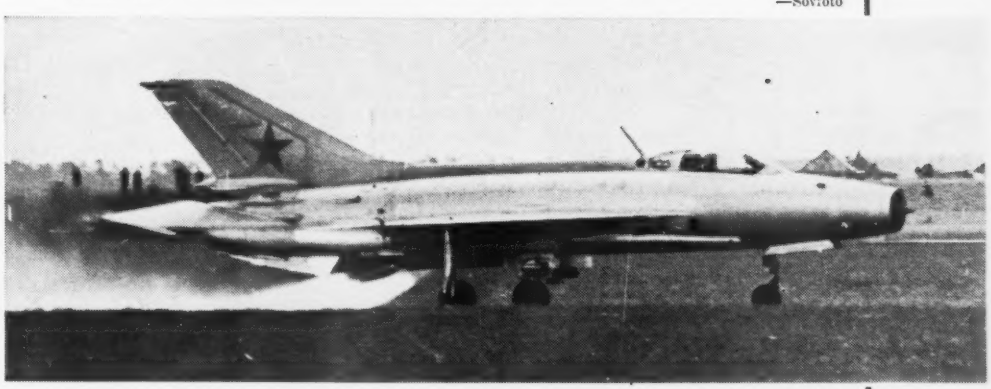
Above and below, huge new Soviet supersonic bomber, Bounder, in flyover, escorted by Fishbed deltawing jet fighter craft armed with air-to-air missiles.



—Sovfoto

Right, latest model YAK-25 supersonic all-weather fighter-bombers show continued development of old design. Below, ground view of light Fishbed deltawing fighter planes.

—Sovfoto



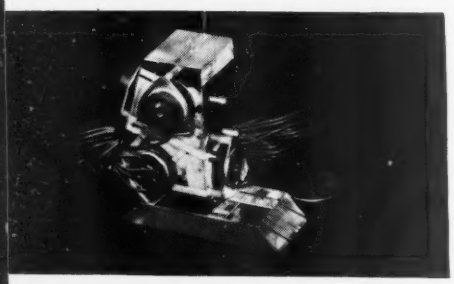
—Sovfoto

Right, giant MI-6 turbine-powered helicopter, some 120 feet long, carries 40-foot mockup of Yuri Gagarin's space capsule.

—Sovfoto

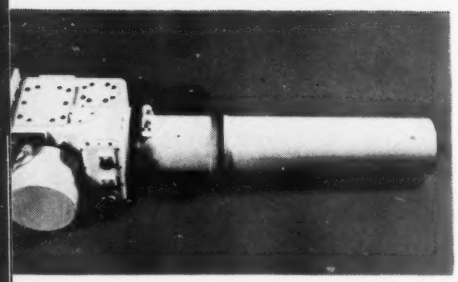
Alinement unit for Minuteman gets calibration tests on 14-ton stable pads which are isolated from building vibration.

TI's ELECTRO-OPTICAL SYSTEMS CAPABILITY



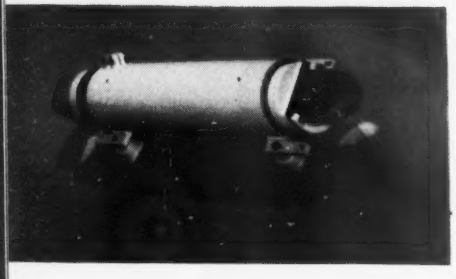
***MINUTEMAN**

Alinement Unit for the Autonetics Division of North American Aviation, Inc. These units establish the vertical reference of Minuteman missile . . . level detectors sense local vertical to an accuracy better than 1 second of arc. The quartz prisms on which the detectors are mounted have angular tolerances of less than 2 seconds of arc and surface flatness of ¼ wavelength of light.



***NIKE-ZEUS**

Optical assembly for Bell Telephone Laboratories. For check of Nike Zeus radar alignment, the tracking system in which this assembly is used has a dynamic accuracy of better than 4 seconds of arc . . . can be adapted to operate in any part of the spectrum from the ultraviolet to the far infrared.



***POLARIS**

Optical deviator for Marine Equipment Department of Nortronics, a division of Northrop Corp. This electro-optical system checks the alignment of the navigation system of the Polaris bearing submarine. It deviates light 180 degrees and maintains accuracy of 2 seconds of arc even in severe vibration, shock and changing temperature environment.

Precision optics, electronics and **mechanic** are being combined at Texas Instrument into new high-accuracy alignment, calibra tion and tracking systems for advance programs such as Minuteman, Polaris an Nike-Zeus. This capability began in 195 when TI integrated complete optical faci ities and the skills of veteran craftsme with the company's total corporate capa bility which includes development of com plex military electronic and mechanica apparatus plus basic and applied researc and manufacture of ultra-pure optica materials and detectors. This unique tech nology has now been extended into th fields of navigation, stabilization, detec tion, tracking, communications and energ conversion. For information on your spe cific electro-optical requirements, contac MARKETING DEPARTMENT.

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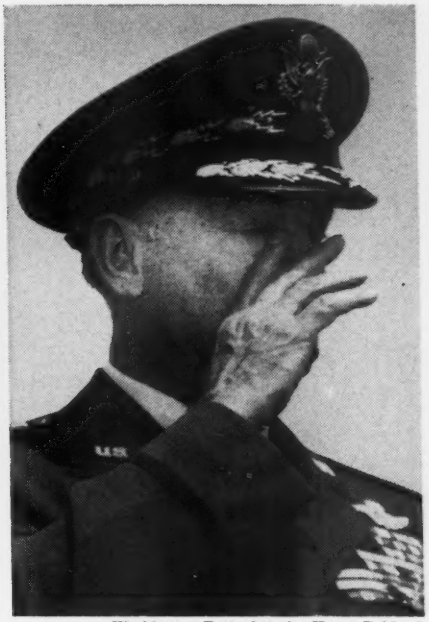
—Wide World Photos, Inc.

Air Secretary Zuckert swears in new USAF Chief of Staff Gen. Curtis LeMay at White House as President, Vice President, and Senator Chavez (N.M.) look on.



—Washington Post photo by Henry Rohland

General White wipes away a tear at June retirement ceremony at Andrews.

the X-15 up to 3,603 miles an hour, better than a mile a second, on June 23. NASA test pilot Joe Walker had reached the previous high, 3,370 mph, on May 25. Major White proceeded further toward the X-15 design goal of 4,000 miles an hour in a flight that began with cabin pressure failure. The pressure fell shortly after release from the B-52 mother plane high over Edwards AFB, Calif. Major White's suit ballooned out, he found it difficult to operate the controls, a vapor cloud formed in the cockpit. However, he was able to stick to the flight plan and become the third fastest human in recorded history. The only two who had gone faster were the first two spacemen—Alan Shepard and Yuri Gagarin. One of the prime aims of this X-15 hop was the simulation of stresses that will be encountered by future spacemen.

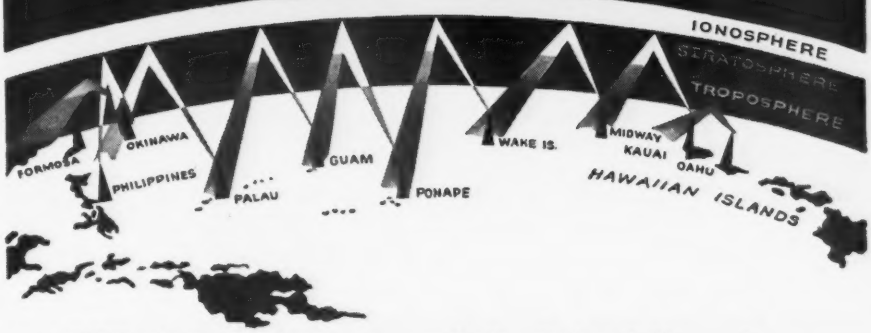
★ Discoverers XXV and XXVI became the fifth and sixth shots in the USAF satellite program to succeed at both ends—launch and recovery. The successive Discoverers have contributed immeasurably to research and material testing for the over-all US space effort.

XXV went up from Vandenberg AFB, Calif., on June 18. Two days later its capsule, released over the Arctic, was sighted falling into the central Pacific by the pilot of a waiting C-119 recovery plane, Capt. Warren G. Schensted. He was also the man to sight the capsule of the Discoverer XIII, the first to be recovered last year. Then the skindivers went into action. They were SSgt. Ray E. McClure, SSgt. William V. Vargas, and SSgt. Leote M. Vigare, all attached to the 76th Air Rescue Squadron, Hickam AFB, Hawaii. The three jumped with a rubber raft from an altitude of 1,000 feet, rolled the capsule into the raft, waited patiently for pickup by a Navy destroyer.

XXVI saw the light of blastoff on

(Continued on page 27)

Another reason . . .
the world becomes smaller



7,500-mile Pacific Scatter Communication System linking major command posts from Hawaii to Formosa was recently designed and built for the U. S. Army Signal Corps

by

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In just 24 months' time, a new, bi-directional

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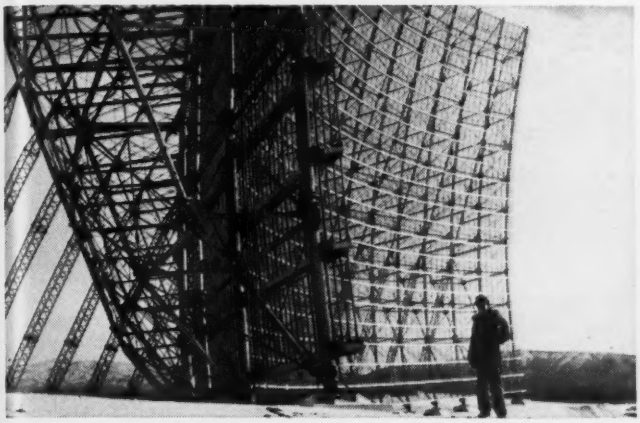

Second USAF Ballistic Missile Early Warning System site became operational at Clear, Alaska, July 1. First site at Thule, Greenland, has been in use since last October. BMEWS would give US fifteen-minute warning of an attack.

Bucolic scene at Wiesbaden, Germany, points up nature of new Lockheed Hercules short-takeoff-and-landing (STOL) configuration on recent tour of Europe. Plane could use rural meadows, secondary roads, and airstrips to operate.

July 7. This time a C-119 piloted by Capt. Jack R. Wilson made an airborne snatch of the released capsule. Captain Wilson's crew sighted the descending capsule about 175 miles northwest of Honolulu. Fourteen minutes later, they had secured it with hook and cable. Twenty minutes of in-reeling after that, XXVI's capsule was in hand.

It was the fourth aerial recovery of a capsule. Eighteen of the twenty-six Discoverers have attained orbit. One that did not do so was Discoverer XXIV, which fell into the Pacific June 8.

★ The second BMEWS station, charged with massive and continuous radar search to the polar northwest of Canada and the United States, went into operation at Clear, Alaska, on July 1. The first has been operational at Thule, Greenland, since last October. Together they form a giant fan of electronic energy over the polar routes that could be used in a mass ICBM attack on North America. A third BMEWS site is under construction in northern England. The BMEWS net is designed to give fifteen minutes' warning of surprise missile attack.

In other major hardware news this month:

A USAF **Thor-Able-Star** blasted a Navy triple-header satellite into space from the Cape June 28. Main element was **Transit IV-A,** first operational prototype of the planned satellite navigation system. Providing signal energy for Transit was a small atomic battery, first atom device to be put into space. The two other elements in the three-satellite launch package were **Greb III,** with a mission of studying X-ray radiation from the sun, and **Injun,** another remote-control researcher looking into the Van Allen radiation belts and their connection with the phenomenon of Northern Lights. Greb and Injun, as it turned out, did not separate from each other in orbit as planned. They thus both worked at reduced efficiency. Transit did split away on schedule.

A program to strengthen the wings of **Boeing B-52G** and **H** aircraft got under way. It was, in the words of a USAF-Boeing statement, aimed "to extend the operational life of these aircraft into the 1970 time period." The work was scheduled to take place over a period of some two years when the planes are scheduled for regular maintenance or modifications. Wing weaknesses that have showed up in recent Air Force checkups do not affect the B-52 fleet's combat readiness at present, USAF stressed.

USAF's **Midas III** went up July 12.

(Continued on page 29)

A new Voice of America broadcasting facility in Liberia is being engineered by Page. Three previous VOA stations in Tangier, Okinawa, and the Philippines, bringing together over 100 nations, were designed and built by

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TEMCO AEROSYSTEMS

DEPOT LEVEL MAINTENANCE

..GIANT SIZE

For almost a year the C-133 Cargomaster has received complete depot level maintenance at Temco Aerosystems. Accommodation of the gigantic aircraft . . largest Air Force 4-engined turboprop cargo transport in service . . tells Temco Aerosystems' size story, both in capabilities and physical installation. Long one of SAC's principal maintenance depots for the Command's tanker fleet, Temco Aerosystems' selection by the Air Force to perform PARC on the MATS C-133 is further recognition of its across-the-board capabilities in the field of complete depot level maintenance. ■ Because of this division's systems integration, installation and flight testing capabilities, and electronic systems development, it has been the choice for work in several fields. The current conversion of a C-130 into a down range missile tracker for Cape Canaveral is a case in point. Another is the conversion of a C-130 into an airborne ECM laboratory for White Sands. Through the union of basic airframe and electronic capabilities Temco Aerosystems has established a major position as a versatile and efficient producer, economical and on time.

LING-TEMCO ELECTRONICS, INC.

TEMCO AEROSYSTEMS DIVISION • P. O. BOX 1056 • GREENVILLE, TEXAS

It was the third developmental missile alarm satellite, first to pass over the USSR in orbit. Days of delay, including a booster fizzle on the launch pad at the Navy's Point Arguello launch facility next door to Vandenberg, preceded the shot. Midas I failed in February, Midas II orbited but its radio failed in May. A Samos reconnaissance satellite, cousin to Midas, orbited in January.

Boeing delivered its first **C-135 Stratolifter** jet transport to the Military Air Transport Service in early June. It was an important milestone for MATS in development of jet capability to meet its global mission. MATS' first pure jet, the C-135 is the transport version of SAC's KC-135 jet aerial tanker.

NASA placed its **Tiros III** weather satellite in orbit from the Cape on July 12—a space-age hurricane hunter timed to the season when the big storms often spawn in the South Atlantic.

And in mid-July, as this magazine went to press, the nation was getting set to send its second **Astronaut** on a suborbital Mercury flight over the Atlantic. USAF Capt. Virgil Grissom or Marine Lt. Col. John H. Glenn, Jr., was expected to follow an astronautical course similar to the one over which Commander Shepard flew in May.

☆

"The Air Force of the day after tomorrow must be truly an aerospace force, unrestrained in its operations by earth's gravity bond and fully clear of the atmospheric runway.

"We do not have a choice as to whether or not we invest in aerospace military forces. That decision is no longer subject to our shaping. It has been shaped by world events and by pressures beyond our control."

The words came from Secretary of the Air Force Eugene M. Zuckert in an address before the Aero Club of Washington in late June. He went on, in one of the best recent statements on the urgent issue of the military mission in space:

"This nation must drive ahead with the peaceful exploration of space. We have no choice but to prepare for every possible peaceful and constructive exploitation of space—research, communication, meteorology, astronomical knowledge, even travel and transport. In short, NASA must succeed.

"But for NASA to succeed, America's peaceful objectives in space must not be subject to interdiction by an unfriendly power. The challenge of nature is sufficient.

"And for America to succeed—in preservation of the nation in freedom, in furtherance of the welfare of men on earth, in exploiting the knowledge of ourselves and our surroundings for man's good—our peaceful objectives on earth must not be subject to interdiction from space.

"We must not delude ourselves. Earth can be dominated from space. Reduced to the scale of a sixteen-inch globe, a vehicle in 300-mile orbit passes over Cleveland, Pittsburgh, and Washington, for example, just six-tenths of an inch above the surface.

"We are determined not to be disfranchised in space, and we are determined that no nation shall be disfranchised on earth by a threat from space.

"Our national policy therefore is and will continue to be to avoid as well as to deter aggression through space."

"Staff Changes," a regular feature of this department, does not appear in this month's "Aerospace World" because of the general reorganization still going on in USAF. The accumulated list of staff changes will appear in this space next month, together with the annual AIR FORCE Magazine "USAF Command and Staff Photochart."

—THE EDITORS

☆

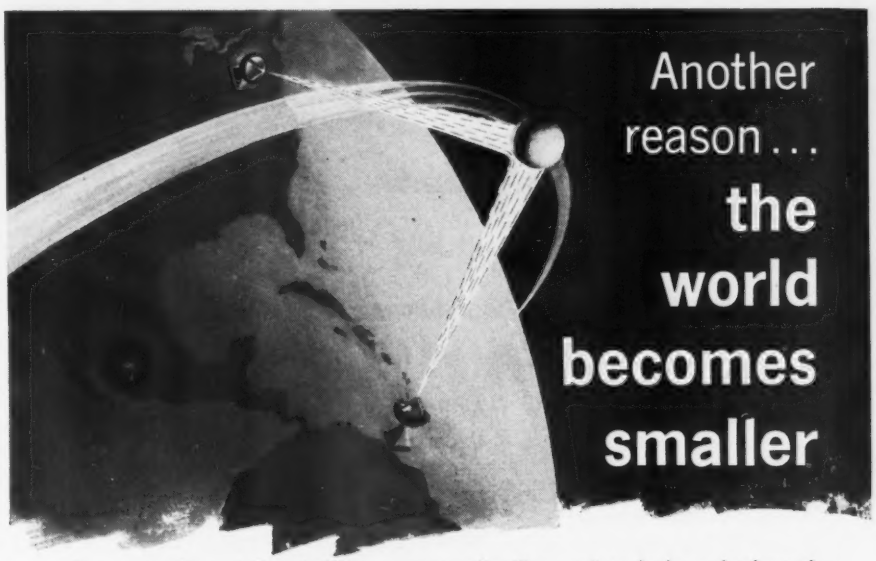
ELSEWHERE IN THE AEROSPACE WORLD:

The US and Canada signed an agreement further integrating their air defense effort. Canada will produce F-104s, receive F-101s from the US.

USAF announced plans to pull out of one British base, Bruntingthorpe, reduce operations at three others—Sculthorpe, Chelveston, Alconbury.

Ground was broken for NORAD's underground operations center in the Colorado Rockies.

A Board of Inquiry ordered a court martial for USAF Col. William M. Banks in connection with tragic collapse of a Texas tower radar station off the East Coast in January. He was in charge of the Boston Air Defense Center, responsible for the tower, at the time. Charges against two of his subordinates, Majs. William R. Sheppard and Reginald L. Stark, were dropped.—END



An experimental satellite communication relay being designed and engineered under cognizance of Rome Air Development Center will transmit voice and teletype 2000 miles through space via a passive orbiting satellite. Stations will be at Floyd, N.Y. and Trinidad.

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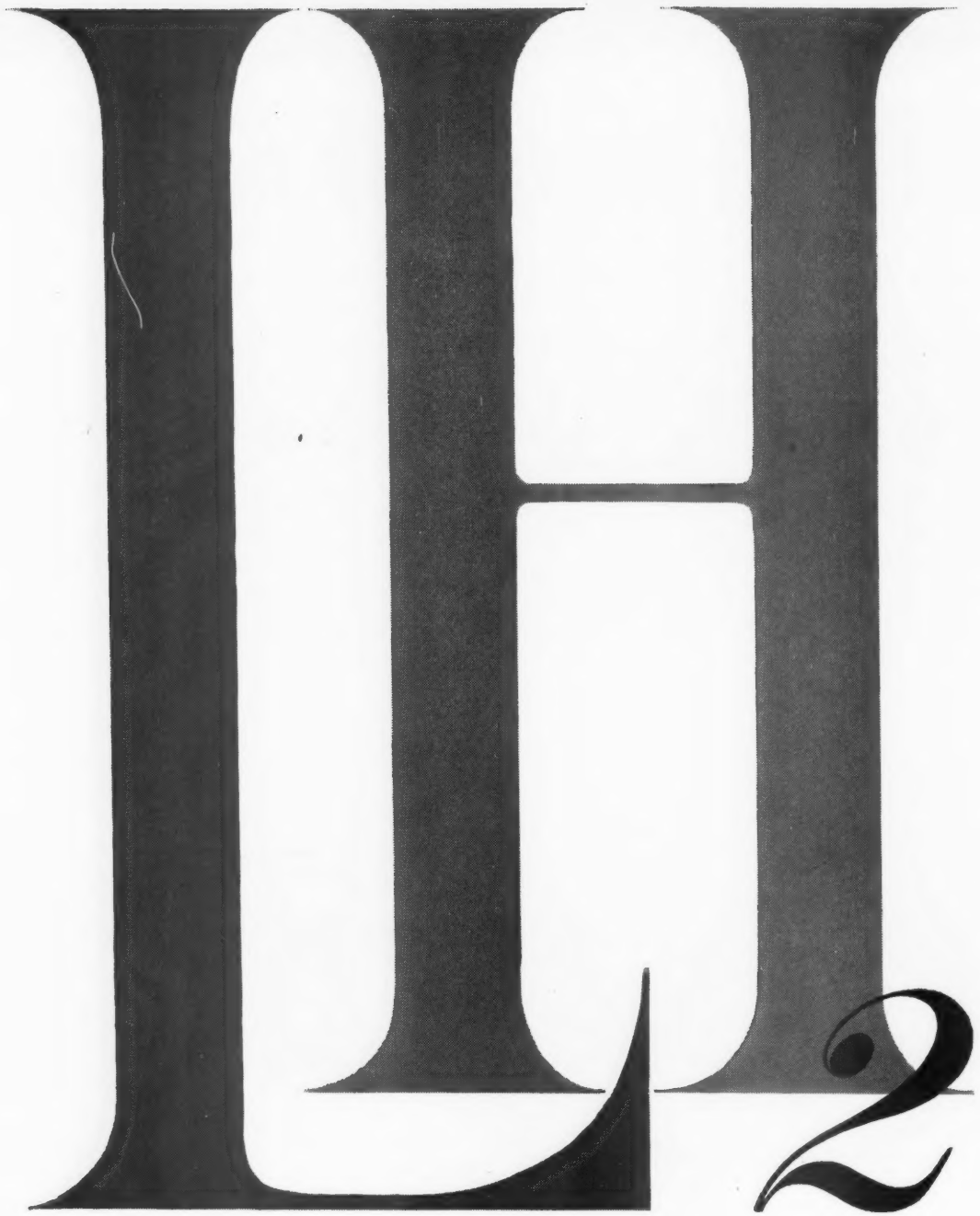

Air Products pioneered in the application as well as the production of liquid hydrogen . . . the ultimate fuel . . . for missiles and rockets. Examples: the test facilities for KIWI, and test facilities for even newer missiles. Air Products possesses missile propellant system capabilities few others can match. If you have a problem in propellant systems, look to Air Products first for the answer.

Air Products
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A NEW DIMENSION IN INDUSTRY

DEFENSE & SPACE DIVISION: General Office: Allentown, Pa. **DISTRICT LOCATIONS:** Dayton, Ohio; Washington, D. C.; Los Angeles, Calif.; Winter Park, Florida.

'Look out!' the F-100 pilot yelled. 'One of my missiles has fired!' The Sidewinder hissed away from the fighter . . . corkscrewed and hunted for a second . . . then streaked for the B-52 . . .

AIR FORCE
AUGUST 1961

DEATH OF A BIG BIRD

Ed Mack Miller

FRIDAY, April 7, was a warm day in Albuquerque. West, across the rugged mountains and canyons of the southern Rockies, hung threatening cloud formations.

More than six miles above the sprawling, colorful New Mexico country—high over ancient Indian pueblos—three aircraft played at the game of death in the sky.

Two were F-100 Supersabres of the 188th Fighter-Interceptor Squadron, New Mexico Air Guard, Kirtland AFB, N.M.

The third was a SAC B-52 Stratofortress of the 95th Bomb Wing, Biggs AFB, El Paso, Tex.

The big bomber was an "unidentified attacker" boring in on an American city. The Guard jets were charged with preventing the "attack" through mock interception.

Flying the lead F-100 was 1st Lt. James Van Scyoc (pronounced "Sock"), on his wing Capt. Dale Dodd. Lieutenant Van Scyoc, who would this day suddenly find himself at the center of tragedy, was a ten-year veteran of the Air Force. He had served in Germany, Japan, and Korea. Twenty-seven and a bachelor, he was judged by fellow Guardsmen a "fighter pilot's fighter pilot"—a man whose first love was flying.

Minutes earlier, they had taken off on a planned intercept mission. Slung under each plane's left wing were two heat-seeking Sidewinder guided missiles armed with TNT warheads. Each Supersabre's

(Continued on following page)

twenty-millimeter cannon was loaded with live ammunition.

The Sidewinder is the air-to-air missile used by Nationalist Chinese pilots with notable success against Communist MIG fighters over Quemoy and Matsu in 1958. Only recently has it been reported that the Reds had produced their own Sidewinder-type weapon.

Guided by semiactive radar until its infrared detector "feels" the heat of the bomber's engines and "homes" the missile in, the deadly Sidewinder is appropriately named. In the animal kingdom, a Sidewinder is a desert rattlesnake said to hunt food by sensing and homing in on the body heat of its victim.

Spotting their giant target, the two Guard pilots made five skillful passes in quick succession. The first was a simulated Sidewinder pass, the rest "cannon practice." All went well.

They were practicing proficiency in the art of killing a big bird. The big bird in this instance, an $8 million, eight-engine B-52, is a potent instrument itself. It can carry a payload of up to 75,000 lethal pounds, gross nearly a half million pounds at takeoff, achieve top speeds just under Mach 1 at a ceiling of more than 50,000 feet. With in-flight refueling, this mighty strategic weapon can deliver a nuclear bomb load anywhere on the globe.

At the controls of the B-52, named *Ciudad Juarez* in honor of the Mexican city across the river from Biggs AFB, sat veteran SAC aircraft commander Capt. Don Blodgett, thirty-nine. The flight was just another SAC training mission, this time with no H-weapon aboard. Just the same old stuff: around the horn for some bomb and nav runs, a few interceptor passes from some Air Guard jockeys in the vicinity of Albuquerque, then more bomb-nav practice, then home. Some people call it "filling squares in the paper war."

In Captain Blodgett's crew were Capt. Ray Obel, thirty-three, the copilot; Capt. Steve Carter, twenty-nine, and Capt. Pete Gineris, thirty, navigators; Capt. George Jackson, twenty-seven electronics warfare instructor; 2d Lt. Glenn Bair, twenty-four, electronics warfare officer; SSgt. Manuel Mieras, twenty-three, crew chief; and SSgt. Ray Singleton, twenty-seven, tail gunner.

At the moment, it was possible for two of the men in the crew, Captain Gineris and Sergeant Mieras, to look down from the B-52 and see the towns where close relatives lived—Gineris' folks in Albuquerque and Mieras' in Grants, N. M., seventy miles due west of Albuquerque.

Occasionally the crew members who could see outside could catch the pair of F-100s as they flashed by. They were hard to track. They came in at you like some kind of voracious flying fish with wide, ugly mouths. They lunged, sharklike, and broke away quickly.

In the ground-controlled interception (GCI) radar site at West Mesa, N. M. (voice-call "Blush First"), the operators were tracking the intercept . . . just as yesterday . . . and the day before . . . as always . . . keeping sharp for the day the whistle might blow . . . when the big bird might have Russian markings.

Some thirty miles to the east, at 33,000 feet, a new TWA Convair 880 jetliner, with seventy-three passengers aboard, had just passed Albuquerque en route from New York to Los Angeles. Capt. Bob Guss, a TWA senior pilot, held the pilot's controls. Idly, with the relaxed awareness of his profession, he switched his scan from the broad savannas of the skies to his instrument panel, then back again to the horizons.

In El Paso, navigator Carter's wife was awaiting the arrival of a new baby. At Biggs, there was a lucky man. He was TSgt. William Thomas. He had been scheduled as crew chief on the B-52. Shortly before departure, however, Sergeant Thomas was stricken with a headache so bad that it necessitated his removal from the flight. He was replaced by Sergeant Mieras.

Northwest of Mt. Taylor, which climbs 11,389 feet some fifty-odd miles west of Albuquerque, a professional hunter on the huge Floyd Lee ranch was setting his cyanide traps for the coyotes, wildcats, and wolves that prey on sheep. The traps fire cyanide pellets into anything that touches them.

Farther to the west, beneath the building cloud pattern, a mass of cold air began picking up speed. Prospectors, ranchers, and tourists turned up their collars at the chill wind and looked at the blue-gray sky.

Jim Van Scyoc and Dale Dodd began their sixth and last pass. Moving almost effortlessly through the mechanics of an intercept, Lieutenant Van Scyoc abruptly felt a "kick." He saw one Sidewinder under his left wing start to hiss away from him toward a prime heat source, one of the B-52's four big jet engine pods.

"Look out!" he yelled on the radio, "one of my missiles has fired. . . ."

Captain Blodgett and Captain Obel, in the cockpit of the B-52, heard the transmission, but for a long moment didn't understand it. Then plane commander Blodgett felt the big plane begin to roll. He turned his wheel to the right to try to bring the left wing up but received no response. He looked out and far to the back, and couldn't see the wing. Suddenly there was fire in the cockpit and he knew they were in trouble. The plane was in a vertical bank by now, pulling lots of Gs. There was no time for anything. He reached down with great difficulty to get hold of his ejection ball and pulled it.

Several whirling seconds passed. Now Captain Blodgett's parachute opened and he was in the overcast. He heard the B-52 explode.

At Blush First, the GCI site, the radar operator stared at his panel. Something was wrong. Did that F-100 pilot say his missile had fired? Why was the B-52 blip slowing down, turning so oddly? Then, in an instant, realization. . . .

Horrified, Van Scyoc and Dodd pulled around in a tight turn as they saw the explosion in the inboard engine on the B-52's left wing. Burning, the huge wing folded and hit the fuselage.

The big bird faltered and fell.

Left, remains of the SAC B-52 *Ciudad Juarez* where the plane fell in the rugged mountains of western New Mexico after being struck by an Air National Guard Sidewinder missile in freak accident. Location of wreckage, weather conditions hampered rescue efforts.

Below, Guard F-100 involved in accident back on ground at New Mexico base. Under left wing is single remaining Sidewinder. The other weapon got loose, homed on B-52's engine pod. F-100 pilot, Lt. James Van Scyoc, was found blameless in the tragedy.

—US Air Force photos

The F-100 pilots watched for parachutes. But they saw none before the stricken plane fell into the undercast close below.

Only a few miles away, Captain Guss on TWA Flight 147 saw a white puff of smoke, then what looked like two bright orange balls trailing black smoke as they fell. He reported immediately to Albuquerque Radio.

In the wilds of New Mexico, there was a crash no one heard. Then there was silence. The time was 12:05 p.m.

To the west the cold wind blew; it would change the warm world of New Mexico into raw, bitter winter.

Numbly, Lieutenant Van Scyoc went through the standard emergency procedures. He told the GCI site what had happened. He and Captain Dodd tried to get below the undercast and locate any survivors. On instruments, they descended cautiously, aware with every thousand feet of the danger they courted. But, try as they might, they could not break through in the area where the '52 had gone down. They returned to the base and landed.

The radar operator at Blush First plotted the last scope position of the B-52 and immediately called Kirtland. In a moment the word was flashing across radio and TV nets, to military officials and private citizens. Within the next seven hours, Kirtland AFB's switchboard was swamped with more than 3,500 calls of all types from all over the world.

But in Albuquerque and in Grants—so near—the relatives of Captain Gineris and Sergeant Mieras had no inkling of what had just happened in the skies above them to two of their loved ones.

At Kirtland, they are used to looking for downed aircraft because it happens a lot in this great and lonesome desert-mountain country. Often it's a civilian lightplane, occasionally a military craft. Three years earlier, in March of 1958, the search in the same general area had been for film producer Mike Todd.

Charred portion of Sidewinder found in wreck is examined by USAF experts.

—US Air Force photo

As soon as word was received, Maj. Gen. Charles M. McCorkle, Commander of Kirtland's Special Weapons Center, put the regular search plan into effect. Col. C. M. Shook, Deputy Base Commander of the 4900th Air Base Group, and Lt. Col. Eugene W. Cox, the search director, had a good man in their operations office. He was Capt. Wilbur H. Biedenkapp, veteran search pilot. Biedenkapp had had experience as search coordinator many times before. His last assignment prior to arriving at Kirtland had been with the 54th Air Rescue Squadron at Goose Bay, Labrador.

Quickly, helicopter, T-33, and C-47 pilots were briefed for aerial search. At about the same time, a ground convoy was being assembled by Maj. Ted Lewis, Kirtland Assistant Operations Officer.

State police were alerted to close off all roads to curiosity seekers. CAP, the Navajo Law and Order Unit, and the Southern Union Gas patrol-line personnel were notified, as well as county emergency personnel and city police in the area.

Helicopters were requested from Holloman AFB and Cannon AFB. At the same time, other bases

(Continued on following page)

phoned in and volunteered their aircraft.

Everyone knew the search would be a mean business. The weather coiled to the west now, ready to strike. High winds were forecast, with snow and sleet.

First positive search report came from the pilot of an H-21 helicopter directed to the last point where the B-52 had been observed on radar. The helicopter flyer reported sighting smoke but was unable to get very close to the crash site because of the weather.

He was requested to take notes of any roads leading to the crash scene so Blush First could direct the ground convoy, which at this time was growing considerably in both size and composition. It now included ambulances, fire trucks, and mobile communications vehicles. Military, state police, county police, and CAP units were taking part. Approximately two hours after the initial sighting, an H-21 with pilots 1st Lt. Richard P. Smith and Captains W. A. Britton and L. T. Wells aboard reported that the wreckage was then visible from the air through a hole in the clouds, about fifteen miles northeast of the tip of Mt. Taylor.

By now, state police and other ground units were proceeding from the north from the town of Cuba and from the west from Grants.

At about 4:00 p.m., four hours after the accident, the first of the convoy vehicles arrived at the Lee ranch, one of the largest in the state, with twenty or more line camps. It is operated as the Fernandez Company, the name it originally had when Bartolome Fernandez was given the land grant by the King of Spain in 1767. When the search team descended on the ranch Friday afternoon Floyd Lee, the present owner, said simply, "What can I do for you?" He knew what the answer would entail. His ranch had been the site in past years of three other crashes in which twenty-seven people had perished.

By 4:30 p.m. an H-43B helicopter, piloted by Capt. Ronald Hansen from Holloman AFB and Capt. William M. Greener from Kirtland, had been sent to the crash site with Kirtland doctors aboard. The air search was nearly four hours old now. Nine conventional aircraft, C-47s and T-33s, and four helicopters, two H-21s and two H-43Bs, were involved. Doing yeoman work in the helicopters, in addition to the crewmen already mentioned, were Capt. Jack Patterson of Holloman AFB and Capt. Donald Passman of Cannon AFB.

The ceiling now was reported as 9,000 feet and constantly lowering. In the vicinity of Mt. Taylor, the cloud deck was on the ground, with blizzard conditions moving in.

Despite the gusting winds and hazardous visibility, the planes and choppers kept flying. An H-21 crew got in close enough to report the B-52 was badly broken up and scattered, with evidence of some burning but no signs of life.

The searchers, however, had early luck. About 5:00 p.m., the H-43 found a break in the weather and was hovering at the crash site when a call came from Maj. Paul J. Murphy, in a T-33. With his spotter, Lt. Col. Ed Costello of Sandia Base, N. M., he had seen two parachutes about two and one-half miles from the crash site.

In minutes, the H-43 had picked up the two men—Captain Blodgett, the aircraft commander, and Sergeant Singleton, the tail gunner.

When Singleton had heard the explosion and seen the flame, he kicked out his tail turret and jumped. He landed in a tree, heard gun shots, followed them until he found Captain Blodgett, who was unable to move because of a fractured pelvis. Singleton used the aircraft commander's parachute to make a shelter, but quickly pulled it down to make a signal when he saw search aircraft moving in.

Then the T-Bird came in low, and the two men shouted with joy when they saw the pilot rock his wings to show he had seen them. They knew the chopper would be there to get them within minutes.

TSgt. John Cicciu and A1C Ban Baca, aided by Sergeant Singleton, got Captain Blodgett aboard. Singleton had been badly burned on the face and hands, but he hardly noticed it at this point. Captain Blodgett and Sergeant Singleton had been out there five hours—but they were picked up while the picking was good. The weather was getting worse minute by minute.

After Blodgett was aboard, Singleton crawled up front with the pilots. The helicopter lifted away and started a right turn. At that moment Singleton shouted, "There's another parachute!"

The chopper pilots, Captains Hansen and Greener, put her down again. Next to the parachute, their crewmen found Capt. George Jackson, the electronics warfare instructor. Captain Jackson was in extreme pain. His back was broken.

The H-43 flew back to the Lee ranch, where doctors ministered briefly to the three survivors. A short while later, 'copter and wounded passengers continued on to Sandia Base Hospital at Albuquerque, landing on the front lawn at 7:00 p.m.

After refueling at the hospital, the helicopter flew the two miles to Kirtland where ground crews checked it. At 8:00 p.m., it took off in darkness, loaded with rations and survival gear, and headed into the teeth of the storm to search for some thirty members of the ground rescue parties who could not be accounted for.

Participating in these hazardous helicopter flights were Capt. W. C. Rose, M.D.; Capt. W. C. Weston, M.D.; and a medic, SSgt. C. F. Coleman. As night came on, snow, high winds, and low temperatures hit the area. Winds reached sixty miles an hour. Helicopters had to tie down at the Lee ranch. Ground vehicles began to bog down on the roads. Many of the persons taking part began to wish they had worn warmer clothes.

First to arrive at the crash site by ground transport were state policemen J. E. Woodard and Drexel Doolin; Bud Rouse, news director of the Grants radio station; Lee ranch foreman Santiago Gonzales; and Eligio Sanchez, the marshal of a nearby town. They could still smell rubber burning in a deep gouge in the ground about seventy-five feet wide. They sent word by radio that there appeared to be two or three bodies in the wreckage.

—US Air Force photo

Helicopter rescuers take one survivor, SSgt. Manuel Mieras, B-52's crew chief, from chopper at Sandia, N. M., Base Hospital. Five B-52 crewmen survived crash.

It appeared that two airmen now remained to be found. Eight crewmen had been aboard the downed B-52. Three had been rescued. Three bodies, at most, were in the wreckage. Search officials at Kirtland passed this information on to searchers. They also further emphasized the need for caution in the face of the snowstorm and high winds in the crash area.

The storm had at this point, in fact, reached blizzard proportions. At the crash site, Santiago Gonzales and his brothers, Telesfor and Alacario, were able to start a fire. This provided temporary relief. For miles in all directions from the site, men were now stranded in their cars. Every vehicle bogged down except for several trucks that had winches. These were able to keep pulling themselves free of the sucking mud by fastening chains to nearby trees.

By 7:00 in the evening TSgt. Daniel J. Fenelli, an air policeman who had been sent to the crash site, and state troopers decided that all but essential personnel should be returned to safety immediately because of the increasing intensity of the blizzard.

Five men were left at the site—two state patrolmen and three Kirtland APs. They tried to get comfortable inside a two-man tent. At the height of the snowstorm a teen-age boy, Billy Johnson, of Grants, showed up at the tent. He hadn't been able to get off the mountain in the storm. That made six occupants in the pup tent, a shelter that seemed flimsier and flimsier as the winds reached gale velocities.

People were stranded in cars all down the mountainside. The only thing that could move in the gumbo was a weasel driven by CMSgt. James Allbrooks of Kirtland, guided by Kirtland civilian employee Eddie Allen and state policeman Woodard. All through the night these men moved up the mountain picking up people, packing them in the weasel, and moving on. They were forced to leave five men inside a big box on the back of an Air Force pickup. The five reported later "It was like a refrigerator . . . even had ice on the inside . . . but it kept us out of the wind."

Rescuers load supplies for drop by 'copter to search parties on ground.

—US Air Force photo

At one of the line cabins, there were more than forty people isolated in an area that would normally accommodate eight. More people sought shelter at the Lee ranch. Someone there mentioned the danger to searchers and possible survivors from the cyanide pellet traps, but no one wanted to talk about that now. The blizzard was the problem of the moment.

At the crash site, as the front moved through, the wind increased and finally tore the tent pegs completely out of the ground, leaving one side exposed to the lash of the blizzard. Almost frozen into chunks of ice by the driving sleet, the men huddled together for protection—but at 5:30 in the morning realized they couldn't hold out any longer. One of the patrolmen signaled frantically on a small portable transmitter for help.

About two hours later, the weasel reached the crash site. At first the rescue team thought the men in the tent were dead. Their eyes were iced shut, and at least one man was only semiconscious. The rescuers had their own problems, however. The exhaust pipe of the weasel had been ruptured by a rock. Patrolman Woodard, who had returned to the scene aboard the weasel, was near exhaustion when an H-21 helicopter first reached the search party in the morning. He refused to leave until he knew all were safe.

As they waited the storm out, the large party at the Lee ranch was served hot meals by Mrs. Lee. She prepared some 200 meals during the search. Mr. Lee offered the parties ranch horses and vehicles. When the rescue cars ran out of gas, he provided more.

When Saturday dawned, it became apparent that there could be little air search during the day because of continuing snow and low ceiling. No one in the search parties really believed that anyone else could have lived through the storm. But the ground searchers plodded on through the day as best they could, although to no avail.

By Sunday morning the cold front had passed. Clearing skies followed. Early in the day a medical officer was able to identify the bodies of Lieutenant Bair, the electronics warfare officer, and Captain Carter, one of the navigators. He also believed a third body to be that of Captain Gineris, the second navigator.

Aircrew briefing for the renewed search took place at 4:00 a.m. at Kirtland. The aircraft were airborne at daybreak. At about 7:00 o'clock, after three hours of fruitless and discouraging search, an excited airman flying along on Capt. Jack Patterson's H-21 shouted

(Continued on following page)

over the radio, "Here's a guy right in front of us, right now, waving his crutch at us!"

The H-21 landed quickly, and picked up the B-52's crew chief, Sgt. Manuel Mieras.

When the Sidewinder hit the B-52, forty-three hours earlier, Mieras was standing just back of the pilot and copilot. He saw either the copilot or a navigator eject, he wasn't sure which. It turned out to have been the copilot. At any rate, Mieras got out through the hole the man's ejection seat left. After a normal parachute descent, Sergeant Mieras hit the ground with a thump and suffered a broken leg. He fashioned a crutch from a tree limb and hobbled to an abandoned sheep herder's hut, one of those on the far reaches of the Lee ranch. There he found a deck of cards and began a marathon game of one-handed pinochle. He also hung out a red flag hoping someone would see it.

Finding Sergeant Mieras seemed to be a bonus. Captain Obel, the copilot, had not yet been accounted for. But it appeared extremely unlikely that he, also, had survived the accident and had also found a cabin to shelter him from the storm. Yet, the full drama was not played out.

By the time Sergeant Mieras had been taken to Sandia Hospital by an H-43, a search aircraft reported sighting yet another survivor. Was it possible? Minutes later, a second report: false alarm. Hopes dropped once more.

In the C-47 flown by Maj. Norman H. Blitch and Capt. George T. Wheldon, Jr., searchers were getting tired. They had been flying back and forth for more than five hours, crossing and crisscrossing in a rectangular pattern, covering the northern half of Mt. Taylor. They were tired-eyed but determined to keep going until they ran low on gas. Captain Wheldon got up and went to the rear to help search with binoculars. He was looking down on the trackless piñon and scrub-oak country when he happened to turn and look out to the rear. He saw something flash in the distance. The flashes appeared to be about ten miles away in a river bed, an area several miles to the east within the plane's assigned search pattern.

Wheldon and Major Blitch at once took the airplane into the area low enough to see an orange and white parachute draped on a small knoll. They called a helicopter, and it picked up the remaining crewman, Captain Obel.

The copilot, who had a fractured vertebra, had been trying to broadcast with his emergency radio and had been using his signaling mirror. It was signals from the latter, of course, that Captain Wheldon sighted.

Captain Obel had run into unexpected difficulty in ejecting from the burning *Ciudad Juarez* on Friday. His parachute opened immediately when he left the plane—at about 30,000 feet instead of the 14,000 for which its automatic opening device had been set. The shock knocked him out and ruptured the blood vessels in his eyes, which were still blood-red when he was picked up. Fortunately, the chute did not rip even though he was moving at the high initial speed of ejection when it opened.

Obel came down in open country, with a slope of about twenty degrees to it. He lit in the midst of a patch of cactus. It was raining. After trying for what seemed like an extremely long time, he finally got his chute loose from the rocks and wrapped himself up in it. He pulled the liferaft from his survival kit over him and slept fitfully Friday afternoon and evening.

He spent Saturday picking dozens of cactus needles from his legs and arms and making signal flags from the orange parachute panels.

In the emergency kit was canned water, condensed rations, some fishing equipment, and a signaling mirror. Captain Obel tried to ration the one pint of water that he had, but he couldn't make himself eat the dry, tasteless rations.

At midnight Saturday night, he took his last sip of water, wrapped himself up in his parachute, crawled under the raft, and went to sleep. He did not awake until about 8:00 Sunday morning. He felt much better. He made his way up a little hill, taking his mirror and survival-kit radio with him, and draped the rest of his parachute out in as wide a pattern as possible.

Then, with heart soaring, Captain Obel heard the first sound of a C-47's engines. He signaled with the mirror and talked on the radio. The mirror did the trick.

Two hours after Captain Obel's rescue on Sunday morning, positive identification was made of the body of Captain Gineris at the Sandia Hospital.

It had been a grim three days.

There had been deep tragedy for three families. Small notes in the back pages of newspapers across the country spelled out the heartbreak—the simple epitaphs of courageous men who had died in the service of their country: "Funeral services for Capt. Peter J. Gineris, 30, were held at the St. George Greek Orthodox Church in Albuquerque. . . ." "The body of Capt. Stephen Carter, 29, East Hartford, Conn., will be sent to Hartford. . . ." "In lieu of flowers, Mrs. Patricia Bair, widow of 2d Lt. Glenn V. Bair, requested that donations be made in her husband's name to Wasatch Academy, Mt. Pleasant, Utah. . . ."

Sergeant Mieras, who had gone on the flight at the last moment, had suffered frostbite in his broken leg. His foot had to be amputated at Sandia Base Hospital.

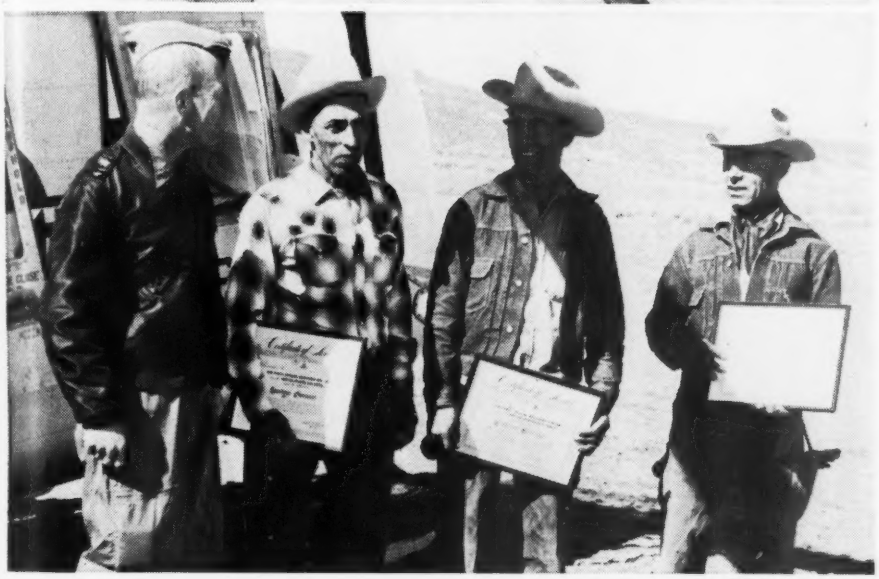
The young pilot of the F-100, Lt. James W. Van Scyoc, waited for the results of the official investigation. Hit hard by the tragedy, his condition approached a state of shock. He knew he hadn't fired the missile intentionally.

For the Air Force and the nation this stacked up as one of the worst of peacetime aerial mishaps, bad enough in itself and frightening, in addition, for the questions it seemed to open about our missile defenses, about the Sidewinder, about air-defense exercises that take place in the skies over the nation day after day.

But, in the inscrutable plan of the Almighty, there had been other factors, too:

Men had performed selflessly and heroically, many men—the doctors, the troopers, the convoy drivers,

Among those who lived through the death of the big bird was aircraft commander Capt. Don Blodgett. Here Maj. Gen. Charles M. McCorkle, Commander of AFSWC, presents "Caterpillar Club" bailout citation to him.



—US Air Force photos

General McCorkle also presented certificates of service to ranch employees who played a prominent part in finding wreck, rescuing '52 crewmen. From left with General are brothers Santiago, Telesfor, Alacario Gonzales. Lee ranch where they work was center of USAF-civil rescue operation near accident scene.

the Lee ranch employees, the search pilots, and especially the helicopter crews, who had braved death innumerable times in the face of brawling, churning winds, low ceilings, snow, and ice.

Finding Captain Blodgett, Sergeant Singleton, and Captain Jackson—two of them badly injured—snatching them just in time from the path of the blizzard—had been great good fortune.

And it was also good fortune that Sergeant Mieras had found the line cabin, that no members of the search party had died in the lash of the gale, that Captain Wheldon had looked back at just the right moment, that none of the searchers afoot and on horseback had tripped one of the many cyanide pellet traps.

Several weeks later, Jim Van Scyoc was completely cleared of any responsibility for the accident. Maj. Gen. Perry B. Griffith, USAF's Deputy Inspector General for Safety, released the official conclusions of the investigating board. The Board found that the Sidewinder was accidentally launched by a freak, one-in-a-million malfunction when moisture seeped into an electrical circuit in the wing of the F-100. The moisture, it was judged, caused a short circuit between the aircraft's main electrical power line and the missile-firing circuit. The pilot was found blameless.

The decision confirmed what the B-52 crew members and Lieutenant Van Scyoc's fellow Guardsmen had believed all along. As Captain Obel put it, "I certainly do not feel that this pilot could be to blame for what happened."

A month after the accident, Biggs AFB spokesmen could report that Captains Blodgett and Obel, the B-52's pilot and copilot, and Sergeant Singleton, the tail gunner, were "mending nicely." They were on convalescent leave.

Captain Jackson, the electronics warfare instructor whose back had been broken, was confined at William Beaumont General Hospital in El Paso. He was expected to recover fully.

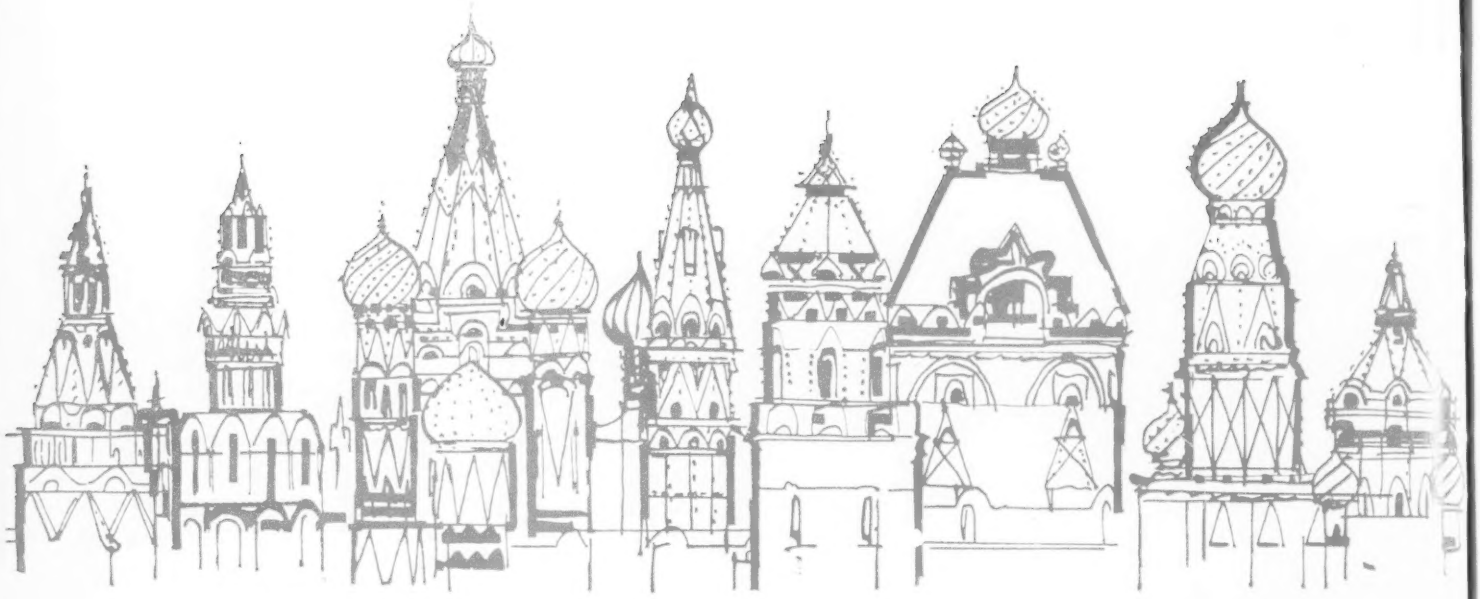
Sergeant Mieras had been sent to Brooks General Hospital at San Antonio to be fitted for an artificial limb. Col. Thomas G. Netcher, Commander of the 95th Bomb Wing, had requested Mieras' return to duty as crew chief at Biggs. A new B-52 had been christened *Ciudad Juarez II*, and Colonel Netcher hoped to put Sergeant Mieras in charge of it.

In another postscript to the death of the big bird, the widow of Capt. Steve Carter, one of the dead navigators, gave birth to a son eleven days after the death of her husband.

All the survivors were recommended for the Air Medal "for the outstanding manner in which they conducted themselves in a period of ultimate stress during and following the accident."

Captains Gineris and Carter, the navigators, and Lieutenant Bair, the electronics warfare officer, were recommended posthumously for AF Commendation Medals. — END

Among Ed Mack Miller's many qualifications for telling this story was his article for May '55 AIR FORCE, *"Seventy-Nine Hours," documenting a B-47 crash in Canada. The selection appears in the* AIR FORCE *anthology,* The Wild Blue. *A United Air Lines captain instructor in Denver, AF Reserve major, and father of eight children, Mr. Miller has written more than 650 articles.*

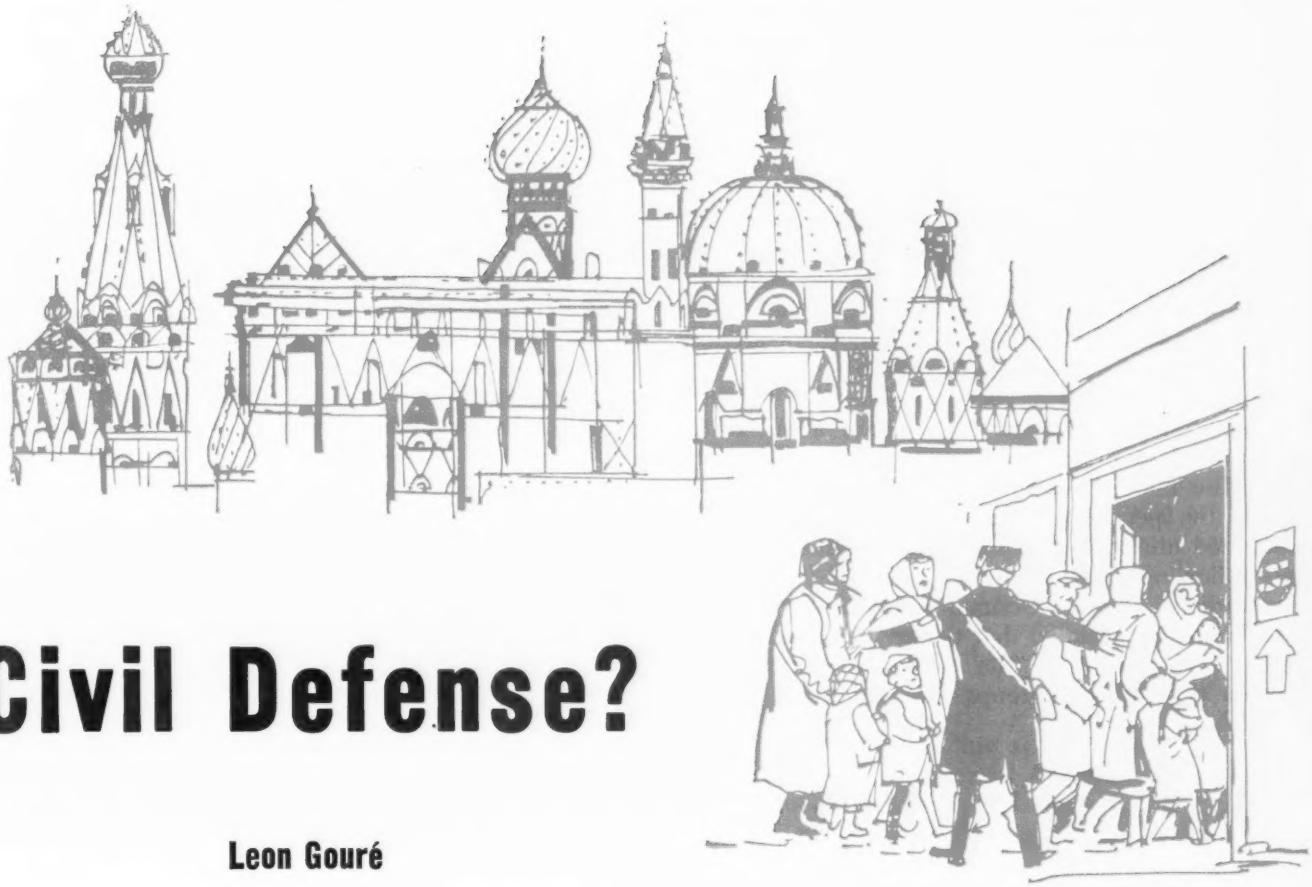


What's Russia Doing About Ci

- *Russia some years ago set for herself the goal of training the nation's entire population for civil defense. Since 1955, three compulsory training programs for all persons over sixteen years of age have been completed.*
- *According to one source, twenty-two million persons, or ten percent of the entire population, now serve in civil defense groups.*
- *Russian publications stress a variety of shelters to protect the public, as well as the use of gas masks, protective clothing, and chemical warfare decontamination kits.*
- *Present plans call for evacuation of the "nonessential" city dwellers to rural areas in the event of attack. "Productive" persons will remain.*
- *Extensive postattack and recovery plans also are past the blueprint stage in the truly impressive Red civil defense setup.*

Preparedness: A Case Study

The Kremlin has devoted considerable attention to an ambitious civil defense program. Broad in scope, it plays a major role as a component of over-all Soviet strength . . .



t Civil Defense?

Leon Gouré

RUSSIA has devoted considerable attention to civil defense preparedness. Here is an authoritative report on the Soviet program in this area as it emerges from recent publications within the USSR.

Background

Soviet leaders have been concerned with civil defense since the early 1920s. They have at various times embarked on extensive civil defense training and construction programs. Between 1935 and 1959, six mass civil defense training programs were instituted. During World War II, when such training was compulsory, 137,000,000 persons are said to have taken the twenty-eight-hour civil defense course. During the second World War, the Soviet population had considerable experience in shelter life. The importance of civil defense as a factor contributing to Soviet war readiness has been stressed by the top marshals of the Soviet Union and has been discussed by ministers of defense at Party congresses—although Premier Khrushchev has made the point that Russia, because of its size and industry dispersal, is less vulnerable to attack than western countries.

Soviet manuals stress that civil defense:

- Must protect the population against all types of weapons: conventional, chemical, bacteriological, nuclear. The threat of the so-called ABC weapons, which are termed "means of mass destruction," has been especially stressed since 1954.
- Must provide important industrial, administrative, and other vital installations with the ability to continue their operations "under condition of attack from the air."
- Must be based on the mass participation of a trained population and must be able to deal quickly with the damage and casualties from an attack.

Organization

Soviet civil defense organization works through the national, territorial, and local administrations and the economic institutes. The small full-time professional staff, which was headed until recently by a first

(Continued on following page)

deputy minister of internal affairs (MVD), develops operational and organizational systems and conducts research. Full-time staffs at the republic, territory, regional, district, and city levels direct the work of formations and groups organized on the bases of existing services and volunteer teams. The formation of civil defense units according to a prescribed table of organization is compulsory for all republics, provinces, counties, cities, districts, factories, collective and state farms, large institutions, and large public buildings and apartment houses.

In a Soviet city there are eleven different civil defense services—medical, shelter, decontamination, and so on—headed by the mayor and a civil defense staff. This organization is duplicated on the district level and in large industrial installations. On the lowest level, in apartment houses and farms, there are the so-called volunteer self-defense groups, each containing eight specialized teams—medical, shelter, fire fighting, and other duties. A group of about forty-eight persons is organized for every 500 residents or more. The units in urban centers are to be supplemented by special rural formations and military or militarized units which come to the assistance of the cities following an attack.

According to a West German writer, Soviet Premier Khrushchev has claimed that twenty-two million persons, or ten percent of the entire population, now serve in civil defense groups. This could be a goal rather than an actuality.

Training

The Soviet authorities have been insisting on the importance of training the *entire* population in civil defense. Since 1955, three *compulsory* training programs for all persons over sixteen years of age have been completed. In 1955 there was a ten-hour program, from 1956 to 1958 a twenty-two-hour program, and in 1959 a fourteen-hour program which stressed practical civil defense work. A new eighteen-hour program has now gone into effect to stress practical work in postattack operations. The training programs familiarize the population with the nature of modern weapons and their effects, teach them to use individual means of protection and how to behave in shelters, and instruct them in first aid, fire fighting, decontamination, and, in rural areas, veterinary assistance to farm animals.

All training is conducted in small groups at places of employment, apartment houses, or farms. According to Soviet press reports the training has been uneven, lagging especially in rural areas, and at times has been only perfunctory, but constant efforts are made to improve its quality and to check its effectiveness.

Shelters, Other Protection

There is little information available on actual construction of shelters by the Russians, although general information on Soviet shelters exists in abundance.

While the Soviet population made use of a variety of shelters during the second World War, few of these would be suitable for present conditions. According to Soviet civil defense literature, the requirements of a modern Soviet shelter are:

- That it have a fire-resistant roof and be capable of withstanding the thermal radiation of a nuclear explosion.
- That the roof be below the surface of the earth and provide a sufficient attenuation factor for fallout radiation. Soviet standards on permissible radiation levels are on the whole similar to those of the West: Fifty roentgens is considered to be the limit of permissible immediate doses; 100 roentgens is an outside permissible cumulative dose over a relatively short period of time.
- That the roof be capable of withstanding the collapse of the building above, the attentuated blast wave of a nuclear explosion, and direct hits by small or medium-caliber high-explosive and incendiary bombs.
- That it have at least one emergency exit with a tunnel, located so as not to be buried under debris.
- That permanent shelters in likely target areas be capable of hermetical sealing against seepage of chemical-biological-radiation weapon agents and of blast wave, and be equipped to allow relatively long-term occupancy.

Soviet manuals describe a wide variety of shelters: heavy detached shelters, detached shelters, subways, basement shelters, field and emergency shelters. Only deep underground shelters, according to Soviet sources, can survive near the ground zero of a nuclear explosion. Such heavy detached shelters are built as tunnels with reinforced concrete walls and have space for upwards of 150 persons, filter-ventilators, steel airtight double doors, food and water storage, toilet facilities, communication equipment, and possibly chemical air purifiers and bottled oxygen.

Another heavy detached type is similar to a World War II bunker with very thick reinforced concrete walls and roof, designed to withstand probably 200 to 300 pounds of pressure per square inch. Such shelters may be two stories high and have equipment similar to that in the deep underground shelters.

A detached shelter frequently described in Soviet literature is the so-called "layer" or "pit" type. This shelter has a roof of one or more thick slabs of reinforced concrete covered with a layer of earth, which may be several feet thick. It is supported by concrete or brick pillars or internal walls which divide the shelter into compartments. Such shelters are partially or completely underground and will probably withstand in excess of 100 pounds of pressure per square inch. They will also be equipped with double doors, filter ventilation units, toilets, water, and other such necessities. These shelters may have space for from 150 to several thousand persons.

Some Soviet leaders have indicated that the Soviet Union intends to make extensive use of subways as shelters. There are subways in operation in Moscow and Leningrad. This year the Kiev subway will begin

operations. These subway systems are fairly deep. The Moscow one could shelter, on lower platforms and in tunnels, from one to two million persons or twenty to forty percent of the city's inhabitants.

The Soviet basement shelter is a special area of the basement of an apartment house or public building designed to meet certain specifications. It has a roof of reinforced concrete, supported by steel or reinforced concrete beams, capable of withstanding the collapse of the building above. It is fireproof, completely underground, and capable of being hermetically sealed. Its basic equipment includes airtight double metal doors of the bulkhead type, a filter ventilation unit, one or more emergency tunnels, toilets, water, heating, telephones, and possibly bottled oxygen. Depending on the building, it may occupy the entire basement or only part of it. It is divided by interior walls into compartments. The recommended capacity of such a shelter is 100 to 150 persons. It may be designed to withstand between ten pounds pressure per square inch and 100 pounds pressure per square inch. According to Soviet manuals, such a shelter would be expected to survive the blast "at some distance" from ground zero.

In addition, Russian publications speak of field and emergency shelters, mostly of the fallout type and usually less permanent. They are to be built by the population when the Soviet government announces a "threatening-situation" alert. These would consist of various types of earth-covered trenches, dugouts, galleries, or tunnels in mountain sides. Their walls would be made of precast concrete, wood, metal sheeting, or other handy materials.

These shelters are to be built in both cities and rural areas, but especially the latter. They would hold from twenty-five to sixty persons, perhaps have heating and a simple ventilation system but not running water. They may or may not have metal doors. For the most part they do not appear to be designed for long-term occupancy. Shelters of this type can be built in one day or less provided the necessary material is available. If the shelters cannot be hermetically sealed, the people using them are instructed to wear their gas masks during an attack. One-family shelters of a similar sort may also be built in suburbs at the cost of the families concerned.

Russian publications also have stressed the use of gas masks, protective clothing, and chemical warfare decontamination kits. No such equipment has been issued to the general public, but there has been wide training in their uses.

Evacuation

In 1958, Soviet literature began to mention evacuation of the urban populations in conjunction with the "threatening-situation" alert. The present plan calls for the evacuation of the nonessential city population to rural areas. Also to be evacuated to suburban areas are various civil defense groups. It is likely that key elements in industry, the Party, and the administration will also be evacuated to shelters outside the cities. Nevertheless, the authorities at present still appear to plan to leave a part of the "productive" elements of the population in the cities.

With civil defense in mind, Soviet city planners have recommended measures to reduce population density in large cities. Civil defense requirements are to be incorporated in the development of new urban districts or centers.

Postattack Operations

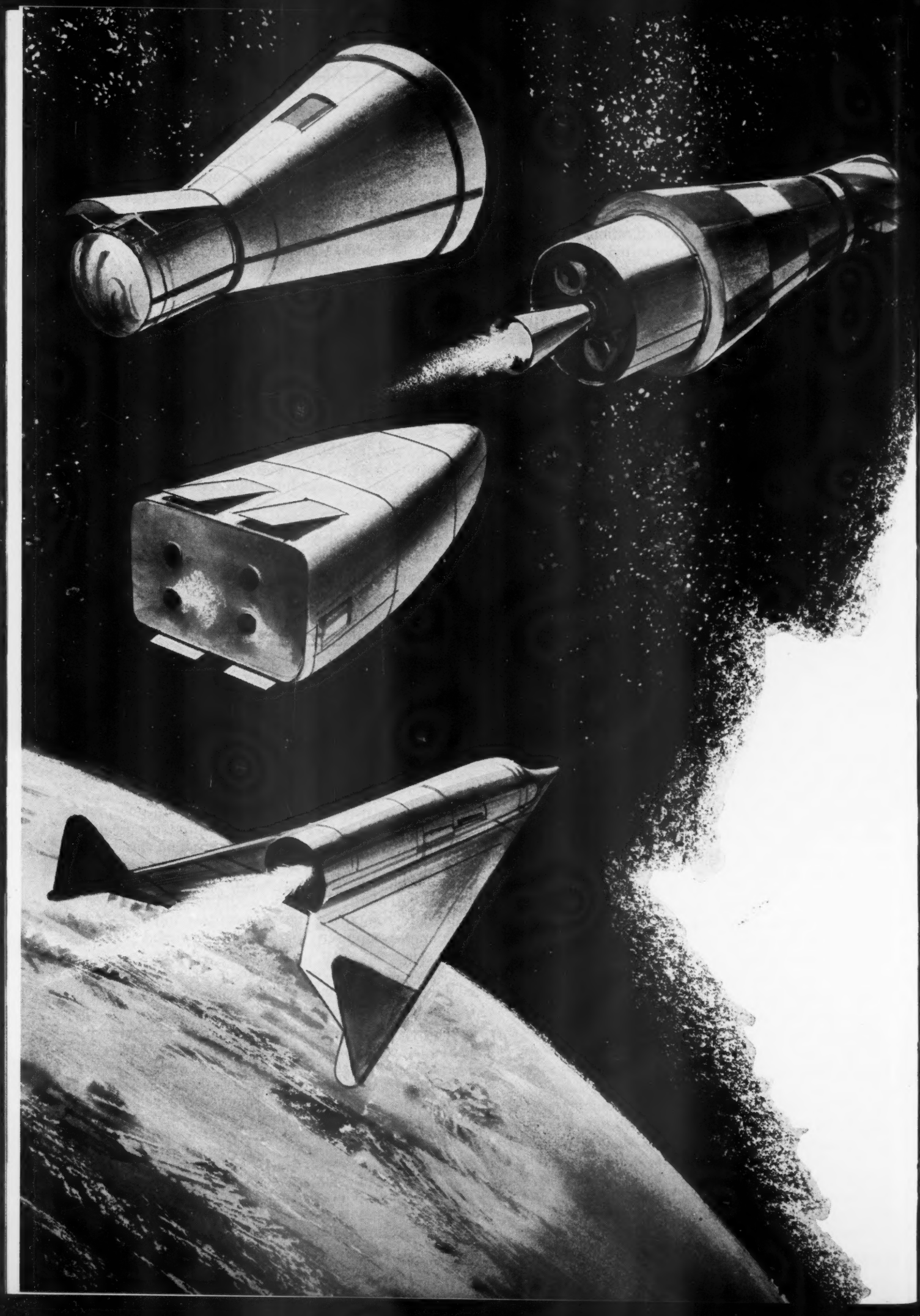
Present Soviet civil defense plans call for large-scale rescue and evacuation operations in the disaster zone immediately after attack in order to give prompt aid to casualties and limit damage. The disaster area is to be reconnoitered by teams equipped with radiological and chemical detection equipment, of which the Soviets have a considerable variety. Following this, first aid, fire fighting, rescue, and decontamination teams move in. Manpower will be provided by surviving civil defense formations, special rural and military formations, and civil defense units from other cities, as well as mobilized citizens who are at hand. Only regular civil defense units will have radiological equipment and chemical detection kits. Rescued persons will be evacuated to uncontaminated areas where mobile or stationary decontamination and medical units will take care of them. Food and other essential supplies are to be provided by special civil defense service teams.

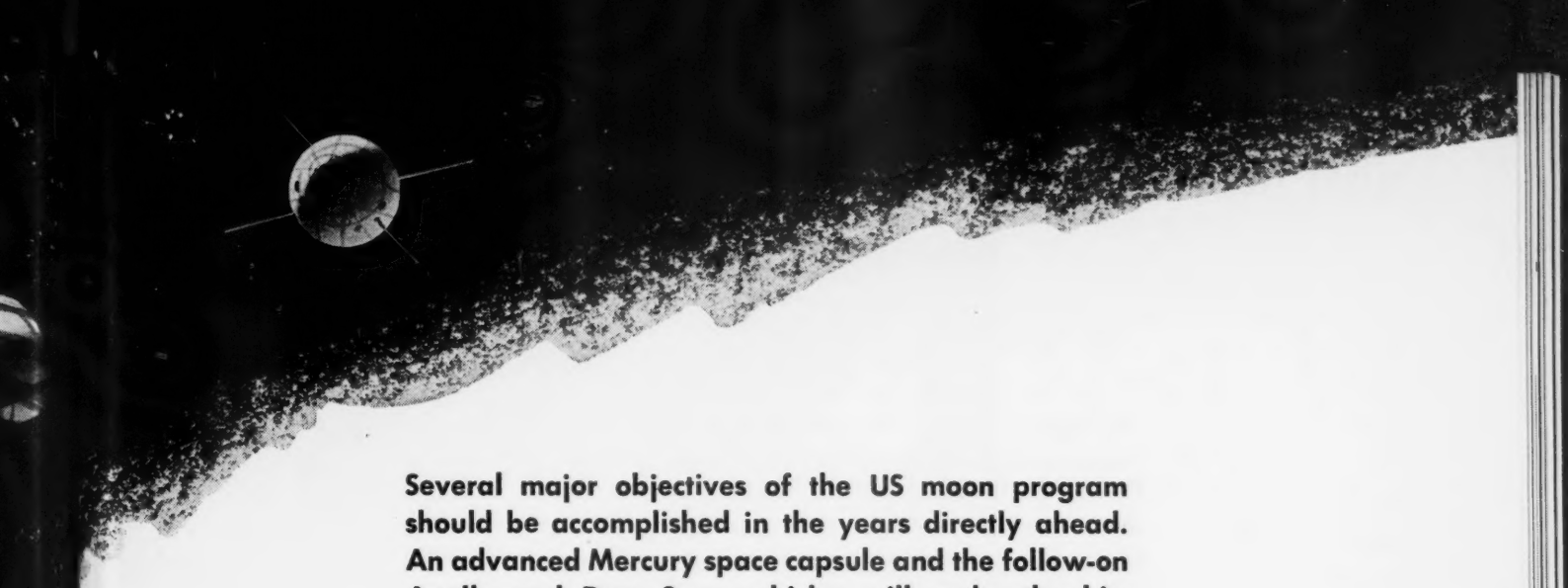
It is evident that this system would be effective only in a zone of partial destruction. In the zone closer to ground zero, intensity of destruction, high rate of radiation, and a probable firestorm would prevent timely rescue of persons not adequately sheltered. Those in surviving shelters are apparently expected to be able to wait until the rescuers reach them.

The extensive Red civil defense program does not appear to have either greatly reassured or greatly alarmed the Soviet citizenry. The program has been in effect for a number of years. The Russian people had considerable experience with such programs in the second World War period. And the Soviet citizen is used to compulsory training courses and so-called "voluntary-compulsory" participation in varied government schemes.

In sum, Russia is engaged in a serious, energetic civil defense program—one that makes a major contribution to her over-all strength.—END

The author, Leon Gouré, is a senior staff member and Soviet area specialist in the social science department of the RAND Corporation. Born in Russia, he lived in Germany and France before coming to this country at the start of World War II. He became a United States citizen while serving in the Army during the war. Mr. Gouré was coauthor of the book Moscow in Crisis, Two Studies in Soviet Controls *and is preparing two others,* The Siege of Leningrad 1941-1943 *and* Soviet Civil Defense.





Several major objectives of the US moon program should be accomplished in the years directly ahead. An advanced Mercury space capsule and the follow-on Apollo and Dyna-Soar vehicles will make the historic early flights farther and farther into space . . .

FLIGHT LINE FOR THE FUTURE

J. S. Butz, Jr.
TECHNICAL EDITOR, AIR FORCE MAGAZINE

THE EXACT timetable for US manned spaceflight during the next decade is subject to so many political and technical uncertainties that it is difficult to predict more than a year in advance. However, the vehicles which will be used and the objectives of the program are pretty well understood today in the government and by industrial groups who will carry it out.

There are nine major objectives in the program, one of which has been accomplished. The objectives are:

- **Suborbital shots.**
- **Orbit.**
- **Landing on a prechosen spot on the earth.**
- **Maneuvering in space.**
- **Rendezvous of two space vehicles in orbit.**
- **Development of highly reliable launch techniques.**
- **Flights to increased altitudes—along orbits that get closer and closer to the moon.**
- **Moon orbit flights.**
- **Moon landing.**

Three reentry vehicles—Mercury, Apollo, and Dyna-Soar—will bear most of the burden of manned spaceflight during the next ten years. An improved Mercury, which can maneuver both in space and the atmosphere, is shown at top right on the opposite page as it prepares to intercept a satellite. If current pressure from Congress and the Air Force persists, the Dyna-Soar winged orbital vehicle (lower left) will be speeded up, and Dyna-Soar probably will orbit before 1965. The other two configurations are possible shapes for the NASA Apollo moon vehicle. The one on top is a Mercury shape with new structure added. Below it is the so-called Eggers shape or "speedboat" type, which is a high-lift and high-drag reentry vehicle.

The encouraging point about these objectives is that the United States apparently will be able to accomplish the first six of them within the next two or three years. The original Mercury capsule will be used as planned for simple orbital flight. Then a new, improved Mercury which can maneuver in space and control its trajectory to some degree during reentry will be able to perform the third, fourth, and fifth objectives. If the Administration heeds congressional and Air Force pressure, the Dyna-Soar will be accelerated and could orbit in three years or a little more.

While the improved Mercury program has not been given the final go-ahead and probably won't be authorized until the first orbital flights have passed, the current planning schedule calls for it to be ready during the summer of 1963. By extending the capability of the Mercury and accelerating the Dyna-Soar the US will be able to fill an undesirable four- or five-year void in its manned spaceflight program. If the US is limited to simple, uncontrolled orbiting during this period, there will be no doubt about the Soviets maintaining their lead in manned-space capability. With the new Mercury and the accelerated Dyna-Soar the US can keep the pressure on the Russians and possibly move ahead in some phases of the manned-space race during the next five years.

The preliminary design phase of the new Mercury has been completed. It will weigh in the neighborhood of 1,500 pounds more than the present version. Most of the extra weight will be invested in a restartable rocket engine and propellant load. This engine will be fired in short bursts to change the vehicle's orbital

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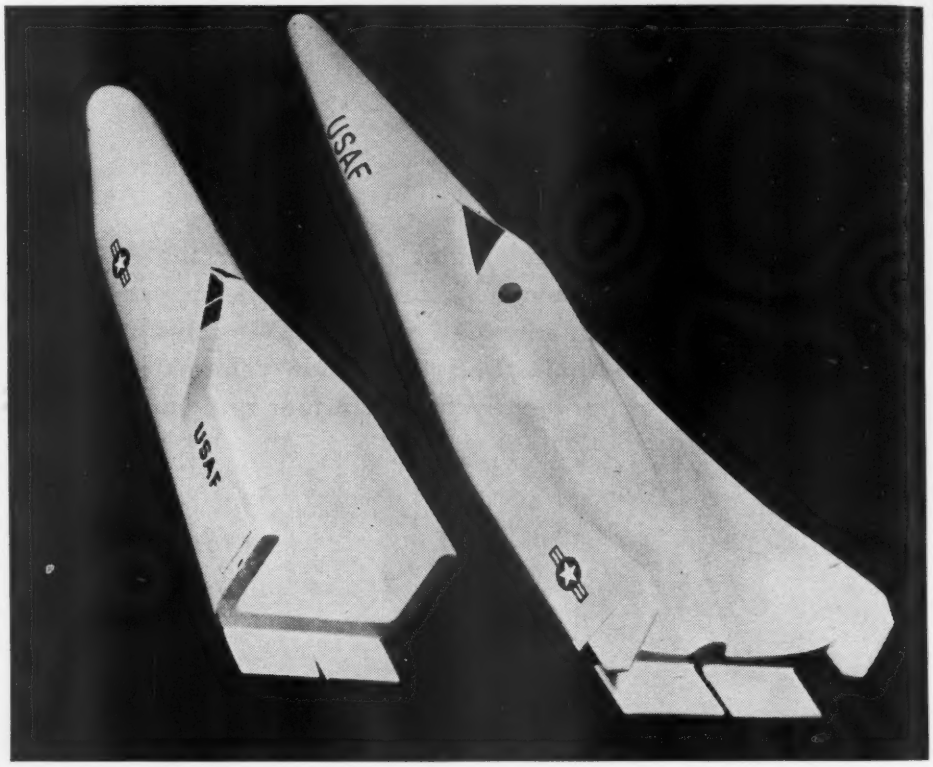

Three types of maneuverable reentry vehicles are shown on this page. A Dyna-Soar-type, orbital-speed vehicle (about 18,000 mph) is on the far right. It is slimmer than the actual Dyna-Soar and would be more efficient at high speeds. A vehicle designed for super-orbital speeds of slightly more than 20,000 mph is on the left in the right-hand photo. The primary objective with this design is to develop maximum lift for maneuvering at top speed. Structural problems dictate the use of slab slides rather than small "wings," such as those on orbital-speed vehicles. The lower surface is angled upward near the nose to improve lift. The deep indentation or ramp behind the crew compartment compromises high-speed performance somewhat to improve subsonic qualities. The wind-tunnel model below shows the escape-speed (25,000 mph and over) reentry vehicle currently recommended by Air Force engineers. This vehicle would be able to reenter the atmosphere after a flight back to the earth from the moon.

plane and altitude in a precise manner, the two basic requirements for maneuvering in space. Rendezvous of two space vehicles is the first practical application for space maneuverability. Its feasibility will be demonstrated by having the new Mercury intercept a small satellite.

The other new feature of major importance will be a number of small flaps spaced evenly around the vehicle just behind the heat shield. During reentry these flaps will be deflected individually or in small groups to develop lift, so that the capsule's trajectory can be controlled. The asymmetrical deflection of the flaps creates lift by unbalancing the airflow around the vehicle. If all of the flaps were opened simultaneously, the capsule would still be a pure drag or ballistic shape because the airflow would remain balanced.

Only a small amount of lift can be developed by using flaps on a symmetrical vehicle like the Mercury. Also, structural considerations may not permit the pilot to develop lift during the maximum heating portion of the reentry and may also limit the length of time that he holds lift. Regardless of the crudeness and comparable inefficiency of the new Mercury's lifting system, the vehicle will provide valuable data on the capabilities of human pilots. It is hoped that the advanced Mercury can be brought down by parachute into a rectangular area of a few hundred square miles. The Dyna-Soar objective is to land on a preselected runway.

The key question about using the improved Mercury or any of the advanced vehicles planned in the US is the availability of adequate boosters. By current estimates, the Atlas-Centaur can be man-rated and ready to launch the improved Mercury within two years. This booster will have a modified Atlas ICBM for the first stage and two 15,000-pound-thrust liquid-hydrogen engines in the second stage. It will be the first vehicle to use high-energy liquid hydrogen for launching men.

A year or so after the Centaur is man-rated, the US booster situation will begin to improve at a rapid rate. The Titan II, with more than 400,000 pounds of thrust in the first stage, and capable of sending the Dyna-Soar on very high speed suborbital flights is being developed by the Air Force. Possibly other boosters with slightly increased performance, will be built to orbit the Dyna-Soar. NASA's 1.5 million-pound-thrust Saturn booster will be ready to carry men and send large vehicles like the Apollo and Dyna-Soar into close orbits about the earth late in 1964, if all goes well. Another probability as a booster for manned vehicles is the large solid-propellant rocket now being developed by the Air Force. NASA's giant Nova rocket, whose size is still undetermined, possibly will be ready for use in 1967 if Congress grants the President's current requests for space funds.

To take full and immediate advantage of the plentiful supply of boosters promised after 1964, two differ-

ent types of advanced, man-carrying aerospace vehicles must be ready for use.

In this context, aerospace vehicles are those able to maneuver in space and reenter the atmosphere. Pure space vehicles such as large satellites and long-life manned stations form another category. However, the reentry aerospace vehicle must be developed before permanent manned-space installations can be constructed, resupplied, and maintained.

The two basic types of aerospace vehicle are represented by the Apollo and the Dyna-Soar. The Dyna-Soar is designed to reenter the atmosphere at orbital speeds up to about 18,000 mph. The Apollo will be able to strike the atmosphere at parabolic or escape speeds of about 25,000 mph.

Design philosophy for the vehicles varies considerably because of the difference in top speed. Aerodynamically, the Apollo and the Dyna-Soar are both advances over the Mercury because they can develop sustained lift. The principal aerodynamic objectives are different in each case, however. On the Dyna-Soar the objective is to develop highest possible lift/drag ratio, so it can maneuver extensively in the atmosphere and achieve maximum glide range. High lift/drag ratio, the measure of aerodynamic efficiency, requires the use of a wing and a long, thin fuselage, similar to that on the Dyna-Soar drawing on page 42. It is estimated that this configuration will give the Dyna-Soar a lift/drag ratio from 1.5 to 2.0, depending upon the flight speed.

The main aerodynamic objective on the Apollo and all escape-speed reentry vehicles is to develop the maximum possible lift with little regard for drag. Maximum lift occurs at very high angles of attack for all vehicles at hypersonic speeds. Therefore, the Apollo will reenter the atmosphere with its nose up at a thirty-degree angle of attack or greater. Its drag as well as lift will be very high so that its lift/drag ratio is low. For this reason, escape-speed reentry vehicles are often called high-lift high-drag configurations.

High lift is necessary on the Apollo to widen its reentry corridor and to relieve the requirements on its guidance system. The dramatic effect of lift in widening the corridor and increasing the safety of moon vehicles returning to earth is best illustrated by first considering the ballistic vehicle which cannot develop lift.

The ballistic vehicle returning to the earth from the moon must fly down a corridor only eight miles high just above the atmosphere, if the maximum deceleration load is limited to ten Gs. If the vehicle comes in slightly above the corridor, it will travel past the earth and begin to orbit out through the Van Allen radiation belts. If it comes in below the corridor, the reentry angle will be too steep and the vehicle will go into dense air too quickly where the deceleration will reach overload proportions very quickly.

The only method of widening the corridor for the pure-drag vehicle is to increase the deceleration load. If this limit is raised to twenty Gs for a very short period, just about the most the pilot can take, the safe corridor becomes twenty-two miles high. The guidance tolerances of this corridor are almost the same as those required to send an ICBM nose cone 5,500 miles and have it hit within one mile of its target. In other words, the ballistic reentry vehicle is marginal for the trip to the moon.

Theoretically, the proper use of lift will allow the reentry corridor depth to be increased more than twenty times over the ballistic depth. However, the reentry problem is so involved—with such a large number of aerodynamic, structural, and control restraints—that under practical conditions it would be impossible to achieve this much improvement. Apparently, there will be little trouble in increasing the corridor depth to fifty miles for a ten-G vehicle, so that the trajectory precision required during a reentry from the moon will be well within the capability of existing systems.

Elaborate studies by NASA, the Air Force, and various industry groups have made it clear that the best reentry procedure is to complete the reentry in less than one circuit of the earth. It has been shown that slowing down gradually, by grazing the atmosphere several times in gradually shrinking orbits, increases the guidance requirement as well as exposing the crew to undue radiation. As a result of these studies, reentries at superorbital speeds will be made quickly down corridors near the poles where the radiation level is low.

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The Air Force's Project Asset will launch seven hypersonic test vehicles, all similar to the one at right, beginning in about eighteen months. These seven-foot-long vehicles with spans of about five feet will be constructed by McDonnell Aircraft Corp. Three major experiments will be performed. Two vehicles will collect aerodynamic data primarily, three will test structure, and two will investigate flight dynamics. Blue Scout rockets will boost the models to Mach 22 speeds. Project Asset will provide a general check on hypersonic design theory. It replaces the program to fire large-scale models of the Dyna-Soar to orbital speeds.

To meet the requirement for the maximum possible lift, it is not necessary for the Apollo or other escape-speed vehicle to have wings. Even wings in the Dyna-Soar sense are not needed. Lift on hypersonic vehicles varies primarily with the area of their lower surfaces and their inclination to the air stream. Optimum escape-speed vehicles will have large flat bottoms if such construction proves to be structurally possible.

Two designs are now receiving close consideration from NASA for the three-man Apollo. One is a modified Mercury shape. Some of the proposed modifications have canted heat shields on the front end to improve lift. Their control flaps would be located on the rear portion probably around the parachute container as shown on page 42.

The other design in strong contention for the Apollo is a so-called Eggers high-lift, high-drag shape, also shown on page 42. This flat-topped shape is named for its originator, A. J. Eggers, Jr., of NASA, who also played an instrumental role in the B-70 design. Aerodynamically, the Eggers shape and the modified Mercury are just about at a standoff. Each develops a maximum lift coefficient of less than one and a maximum lift/drag ratio of around one. The choice between them probably will hinge on other considerations.

The area of greatest concern on both the Dyna-Soar and the Apollo is the structure. Each vehicle is pioneering an entirely new concept in high-temperature structures for manned vehicles. The Dyna-Soar has a radiation-cooled hot structure. Its nose cap, which must take the highest temperatures, will be made of a graphite-ceramic material. The leading edges will be thick sections of coated molybdenum. Most of the remainder of the structure will consist of a thin molybdenum skin backed up underneath by a layer of insulation. Below this there will be an intermediate structure of Rene 41 nickel alloy to hold the skin panels in place. Underneath the intermediate members there will be a heavy truss work of the nickel alloy Rene 41 to carry the main loads.

Basically this is the same type of structural design used on canvas-covered aircraft. The skin is unstressed and does not assist in carrying the main loads.

The Dyna-Soar's molybdenum skin panels efficiently radiate to the atmosphere most of the heat load transmitted to the vehicle during reentry. Structural temperature will stabilize out at about 1,600 degrees Fahrenheit. The pilot's compartment probably will have a double wall filled with a jellied substance consisting mostly of water. Heat entering the compartment will be absorbed by boiling the water away. It will also be necessary to use a small refrigeration unit in conjunction with the water wall to keep the crew compartment at seventy degrees Fahrenheit. The equipment and instrumentation bay adjoining the pilot's compartment will require a simpler cooling job because its temperature probably will be kept at about 200 degrees Fahrenheit.

Structurally, the Apollo presents just about double the problem of the Dyna-Soar. Even though the Apollo's reentry speed is only about fifty percent greater than the Dyna-Soar, it has to dissipate twice the kinetic energy. It is not possible for a radiation-cooled structure made of available materials to dissipate this heat load. It now appears that a thick ablating skin on the entire outer surface will provide adequate heat protection for the Apollo and other superorbital reentry vehicles. The basic technology for lightweight high-temperature ablating skin was developed during the ballistic missile program.

The entire outer surface of the moon vehicles will have to be replaced after each flight. They will not be able to maneuver at very high speeds for as long a period as radiation-cooled structures such as the Dyna-Soar. However, this is not expected to create an operational problem for a number of years. The ultimate hope is to have an outer surface which will ablate at superorbital speeds and radiate at orbital speeds and below.

The takeoff problems of the Apollo and the Dyna-Soar closely approximate those of the Mercury. Safety during launch by large rocket boosters is of critical concern with all manned space vehicles. NASA and the Air Force will undoubtedly continue to work together on this problem.

All vehicles will use auxiliary rocket systems to carry the manned vehicle clear of the booster rocket if trouble develops on the launch pad or in flight while the booster is firing. A small solid-propellant rocket is carried in the rear of Dyna-Soar primarily for this purpose. The rocket has enough power to allow the Dyna-Soar to take off from the top of its booster and to orient itself over Cape Canaveral for a power-off landing on the skid strip there. If it isn't possible for the pilot to land on a prepared surface, he will use his ejection seat and come down by parachute.

It is probable that the Apollo will use an escape rocket tower similar to that on the Mercury. These vehicles have a more difficult center-of-gravity problem than the winged Dyna-Soar during periods of low-speed flight. Placing the weight of the escape rockets forward moves the center of gravity to a more manageable position.

Both NASA and the Air Force are interested in giving the crew of manned vehicles more control over the booster rockets during launch. The crew won't try to guide the rocket vehicles but will monitor its systems. In case of trouble, they will not have to rely completely on automatic safety devices and can cut out the malfunctioning system and switch to backups. Numerous plans of this type are being considered. One of the main objectives of the improved Mercury program is to get as much flight time as possible on the various schemes for launch safety.

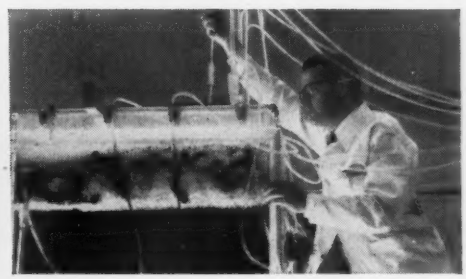
The ultimate objective of the launch safety effort and all of the orbital flights of the next few years is to make spaceflight at least as safe as flying in high-performance military aircraft. There is definite hope that this can be accomplished, eventually. However, men will have to learn to fly in space by doing so. Simulators and training equipment on the ground will play an important part in the learning process, but there can be no substitute for flight time—in large quantities and way out.—END

TWIN-TURBINE HELICOPTER. The Boeing-Vertol 107—fastest, smoothest-riding commercial helicopter now flying—goes into service with New York Airways this summer. It seats 25 passengers in comfort, cruises at 155 mph and has built-in flotation for water landings. The 107 is now undergoing FAA certification testing. It has been ordered for service in Japan, Canada and Sweden. A special version was winner in recent competition for a U.S. Marine Corps assault transport helicopter.

Capability has many faces at Boeing

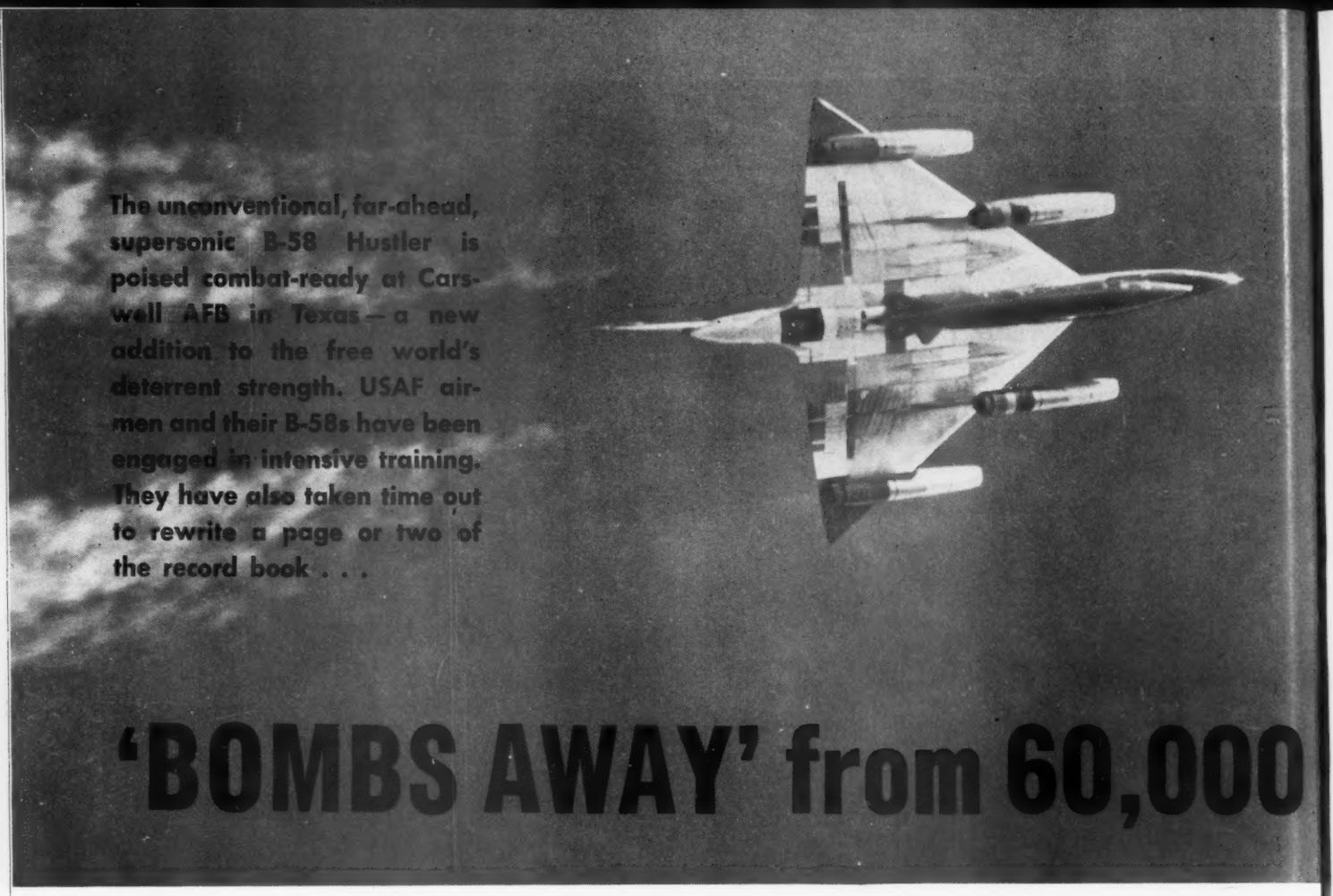
JET-AGE FIRE FIGHTER. Boeing gas turbine engines power fire trucks in San Francisco and Seattle. These 330 hp engines weigh only 335 pounds, propel 15-ton trucks from standing start to 25 mph in 9 seconds.

SPACE GLIDER. Drawing of U.S. Air Force's Dyna-Soar manned space glider, designed to rocket into space, then re-enter the earth's atmosphere for conventional pilot-controlled landing. Boeing is system contractor for Dyna-Soar.



OXYGEN FOR SPACE. Boeing space medicine research includes growth of green algae for conversion of carbon dioxide into oxygen in space vehicles. In test, a Boeing researcher has lived 56 hours on algae-produced oxygen in sealed space chamber, proving potential of carbon dioxide-algae-oxygen cycle.

BOEING



The unconventional, far-ahead, supersonic B-58 Hustler is poised combat-ready at Carswell AFB in Texas—a new addition to the free world's deterrent strength. USAF airmen and their B-58s have been engaged in intensive training. They have also taken time out to rewrite a page or two of the record book . . .

'BOMBS AWAY' from 60,000

Col. J. K. Johnson, USAF

FORMER COMMANDER, 43d BOMB WING (M), SAC

THE TARGET is Deerfield, Mass. You're twelve miles up, moving at twice the speed of sound. But there's no sense of speed, of motion. You seem to be hanging high above the earth on an invisible thread strung from somewhere in the universe.

It's calm, smooth, peaceful, quiet—in sharp contrast to the dread lethality of your bomb load. Actually, the bomb load is simulated. This is a practice strike. It could be for real. Deerfield, some 3,500 miles from home base by a circuitous exercise route, provides a particular pattern on a radar screen. There is a major target area in a potential enemy's homeland that would yield a similar pattern.

Below is the northeastern tip of Lake Ontario. You streak toward target on a true heading of 125 degrees, roughly south-southeast. The bomber, on autopilot, is virtually flying itself. You keep your right hand on the stick, your eyes on the instruments and sky. The stick reminds you that you used to be a fighter pilot; most bombers have yokes instead. By pressing a button on the stick, you could instantly take control back from the autopilot. Behind you, the navigator-bombardier and the third crew member, the defense systems operator, read their instruments, speak a few words occasionally.

The view from the cockpit, as the three of you commence the routine of target approach, is impressive. It may not quite rival those reported by the high-altitude record setters and balloonists, or the nation's first Astronaut, but it still covers a giant field of vision. To the right, far below, are the lights of Buffalo, N. Y., 150 miles away. You see a lot of territory from a dozen miles up—although you don't really need to for purposes of this mission. All the information required to plunk your "electronic payload" on target is carried in black boxes in the plane. It is automatically fed to computers to keep you on course.

Yesterday, back at Carswell Air Force Base in Texas, you and the other two members of your crew studied the target and established a flight profile—how many miles, and at what speeds and altitudes. To fulfill mission requirements, the route was plotted from Texas through North Dakota, back to Lake Superior northwest of Sault St. Marie, Mich. Then the Mach-2-plus dash for target.

"Estimated release time, nine minutes," the navigator-bombardier says quietly.

Downstairs, an Air Force radar-bomb-scoring crew, working in a trailer parked near Deerfield, has you on radar. Your course is automatically tracked with a pen that moves across a large graph without benefit of human hand. This is the record of exactly what you did—when you did it—and how well you "bombed" the simulated target in Deerfield.

From the earphones, the navigator comes in again loud and clear:

"Time-to-go meter, 240 seconds."

The bomb-nav system is flying the airplane, sending out a clear electronic signal being heard a millisecond later in the radar-bomb-scoring trailer. When the signal stops, it means that the bomb-nav system has simulated release of the payload—starting the imaginary weapon on its trajectory toward the target.

Again, the navigator: "Time to go, five seconds."

"Four, three, two, one—bombs away!"

A few minutes more and through the earphones from the radar-bomb-score people, 60,000 feet below, comes a coded message. In plain language, it means:

"Right in the pickle barrel!"

You're in! You take the stick, begin your turn to "loaf" subsonically back to Carswell and the conclusion of another combat-training mission for SAC's B-58 Hustler bomber.

* * *

Hustling airmen and Hustler aircraft of SAC's 43d Bombardment Wing (Medium), based at Carswell, fly training missions such as this around the clock. The 43d, which I commanded until recently, is presently the only USAF wing flying the B-58. A second wing, the 305th, will be activated this year at Bunker Hill AFB, Ind. About sixty of the planes are now in existence, an inclusive total of 116 programed.

What do we at Carswell think of the Convair-manufactured B-58? In terms of hardware, a few words sum it up: She's a sweet airplane. Strategically speaking, we see the '58 as a vital element in USAF's mixed aerial arsenal. The Hustler is, so far as we know, the only supersonic strategic bomber in the world today—and as such a powerful swift-strike threat to any potential aggressor.

Our B-58s can hit targets anywhere in the world from great altitudes at prolonged dash speeds more than twice the speed of sound.

They can also execute cross-country bomb runs at treetop level, where ground radar is blind. Recently, one of our B-58s hedgehopped 1,400 miles across four states at 700 miles an hour. The plane was never more than 500 feet off the ground, sometimes as low as 200 feet.

Combining these two capabilities, the Hustler could make an intercontinental approach at high altitude and Mach 2, then drop down under the enemy's electronic shield for approach to target and departure. The B-58's comparatively small size would add to the enemy's radar detection problem.

(Continued on following page)

—US Air Force photos

Caught by the camera zooming in flight, the supersonic B-58 shows its sleek and deadly lines. Visible under the fuselage is disposable pod, which can help perform a variety of missions.

This Hustler, shown during aerial refueling en route to Paris in May, set transatlantic speed record. Aircraft commander was SAC's Maj. William Payne. Record set, New York-Paris: 3 hours, 20 minutes.

—US Air Force photos

With the assistance of midair refueling, the '58 can make a nonstop round trip to any spot on the surface of the globe. The 43d Wing some months ago recorded a mission of 11,000 miles.

Underlining the plane's potentials, our B-58s have performed spectacularly through their first year as operational aircraft. They achieved this status last summer, four years after the plane's first flight.

• In September of 1960, a 43d Wing B-58 piloted by Lt. Col. Harold F. Confer won the bombing event at the annual SAC Combat Competition—usually known as the SAC World Series. The Carswell Hustler outscored a dozen other SAC planes—B-52s, B-47s, and one other B-58—in both high- and low-level bombing, radar and visual. It was the first time out in the annual competition for a B-58. The cream of SAC's combat-ready crews from around the world annually take part in this World Series.

• Then, in January of this year, two B-58s of the 43d brought home a hatful of closed-course speed-payload records. The first, flown by Maj. Henry J. Deutschendorf, Jr., set six marks on January 12 by zooming at an average 1,200.194 mph for 1,000 kilometers and at an average 1,061.808 mph for 2,000 kilometers. One thousand kilometers is about 621 miles; 2,000 km, about 1,242 miles. The plane carried a 4,400-pound, or 2,000-kilogram, payload; records were set in the no-payload, 1,000-kilogram, and 2,000-kilogram categories in this one flight. Five of the records were held previously by the Russians; one was set in a USAF F-101 in 1959.

Two days later, on January 14, Colonel Confer and his crew raced 1,000 kilometers at an average 1,284.73 mph to break the three new speed-payload records for that distance. Colonel Confer's plane received the Thompson Trophy, privately awarded annual symbol of supremacy in closed-course speed flying. Both planes in the January flights flew over a course that began at Edwards AFB, Calif., and covered portions of a number of states in the Southwest.

• New glories came to the Hustler on May 10, when one of our 43d Wing planes established what we believe to be a world record for sustained speed. Piloted by Maj. Elmer E. Murphy, a B-58 averaged 1,302 miles an hour in a flight lasting more than half an hour. The speed run took place over a closed

—US Air Force photo

course of 669.4 miles, also in the Southwest. USAF thus became eligible to receive permanent possession of the Aero Club of France's Bleriot Trophy. The award, named for the great French aerial pioneer, was to go permanently to the first aircraft to average at least 1,243 mph (2,000 kilometers per hour) for thirty minutes.

• Two weeks after that, on May 26, another of our aircraft flashed nonstop from Carswell to Paris, France, in the dazzling three-record-breaking time of six hours and fifteen minutes. Time from New York to Paris was three hours and twenty minutes, two hours and twenty-five minutes faster than the previous mark set by a Boeing 707 commercial jet. In addition to the transatlantic mark, the '58 set a Carswell-Washington record of two hours and sixteen minutes and a Washington-New York fastest-ever mark of nineteen minutes. It refueled twice en route.

With their flight, pilot Maj. William R. Payne and his crew commemorated the thirty-fourth anniversary of Charles A. Lindbergh's Atlantic crossing of May 20-21, 1927. That first nonstop hop took thirty-three and one-half hours. This new transatlantic dash also spectacularly celebrated the opening of the twenty-fourth Paris International Air Show.

Sadly, tragedy also entered the picture in Paris. The three men who set the May 10 record—Major Murphy, navigator-bombardier Maj. Eugene E. Moses, and defense systems operator Capt. Raymond R. Wagener—crashed and were killed while taking part in an aerial demonstration event of the Paris show on June 3. They were flying the '58 that established the transoceanic mark a week previously.

The B-58 is an unconventional, far-ahead aircraft. It is unconventional in size, in appearance, in its mission techniques. In one giant step, the B-58 has achieved a greater speed increase over the fastest previous strategic bomber than was reached in the preceding fifty years of aircraft design and manufacture. At dash speed, it is more than twice as fast as the next fastest bomber now in service.

For a strategic bomber, the B-58 is surprisingly small. The B-36, the B-47, and the B-52, older members of the strategic family, have all been large airplanes. The wingspan of the Hustler, for example, is

(Continued on following page)

FAA Administrator Najeeb Halaby chats with Colonel Johnson, left, Maj. Gen. Nils C. Ohman, 19th Air Division Commander, center, after B-58 orientation hop.

about twenty-five percent of the span of the B-36, about forty percent of the span of the B-47, about thirty percent of the span of the B-52. Like the B-47, the '58 carries a crew of three. The B-52 has six in its crew. The B-36 had sixteen, five of them relief crewmen.

The gross weight of the B-58 is over 160,000 pounds. The span of its deltawing is fifty-six feet, ten inches. The plane is ninety-six feet, nine inches long. It stands thirty feet high. Powering it are four General Electric J79 turbojets, mounted on wing pods, each of which is in the 15,000-pound-thrust class with afterburners. The B-58 can carry more than 15,000 gallons of fuel in a disposable pod carried under the fuselage.

The disposable pod is an important element of the B-58 concept. It provides broad mission flexibility. Fuel and payload are stored in the pod. After an actual attack, the B-58 would drop its pod and return home "clean" without waste volume contained in an empty bomb bay and without waste weight and volume in an empty fuel tank. An improved two-component pod is now being tested.

The B-58 is a highly integrated, highly automated weapon system.

The bombing and navigation system, designed, tailored, and built by the Sperry Gyroscope Company, plays a major role. At the B-58's speed, there is no man in the world who could quickly enough go through the old navigation procedures involving logging and charting with a pencil, manual celestial fixing with hand-held sextant, and correlation of bits and pieces of instrument readings and electronic data. So far as bombing is concerned, the high speed at which targets are approached means that the weapon must be released at a considerable distance from target and at a very precise instant. The integrated bomb-nav system does this complex job.

One feature of this system is the in-flight automatic printer. As aircraft increase speed and the data required of the navigator becomes more complex, the task of recording all necessary information accurately becomes extremely difficult—if not humanly impossible. If, for example, an aircraft is flying in an easterly direction at seventy degrees north latitude with a ground speed of 1,400 knots, you couldn't possibly usefully read the longitude counter, since it would be changing seventy minutes of arc per minute of time.

In the B-58, the in-flight printer can print a complete eight-line sequence containing information such as time, aircraft position, heading, track, airspeed, ground speed, and so on at the speed of one complete sequence per second.

Other B-58 black boxes control electronic countermeasures gear certain to give enemy radar a bad time, the plane's potent T-171E3 twenty-millimeter aerial cannon, and extensive air-conditioning equipment. The cannon automatically locks on and fires at an attacking interceptor. Air-conditioning maintains a steady seventy-five-degree cabin temperature at any altitude over the Arctic or the tropics. Electronics devices and crewmen are thus kept quite comfortable.

The B-58's large-surfaced deltawing, along with its unique pods, give it a striking appearance. The optimum lift-drag-ratio wing makes the Hustler a very stable airplane from slow takeoff and landing speeds to Mach 2 at 60,000. The pilot can vary approach and landing techniques without suddenly meeting deadly surprises—often the price of straying from optimum speed, rate of descent, or angle of attack with other high-performance craft.

Another important development in the B-58, this one not apparent to the naked eye, is in the material used for its heat-and-fatigue-resistant skin. At twice the speed of sound, external temperatures on an aircraft rise to about 300 degrees. To meet this problem, a Fiberglas, aluminum, and stainless-steel-honeycomb material, sandwiched between two layers of metal, was designed. This honeycomb-sandwich material is used extensively. It comprises about ninety percent of the wing surface.

Sixteen industrial concerns produce major items for the B-58 under the prime contractor, Convair (now General Dynamics/Fort Worth). More than 4,700 participating suppliers and subcontractors provide parts. Two out of every three dollars spent in building the Hustler are paid to subcontractors.

We think that here is another case where the Air Force-industry team has turned out a really fine weapon system. We're proud to fly it.—END

The author, Col. James K. Johnson, is now Director of Operations of SAC's 19th Air Division at Carswell AFB, N. M. The B-58-equipped 43d Bomb Wing, which he commanded until recently and of which he writes above, is a component of the 19th Division. New 43d Commander is Col. Everett W. Holstrom. Colonel Johnson was a World War II fighter pilot, a double jet ace in Korea, has been in SAC since 1956. He took command of SAC's first B-58s in 1959.

THE SPACE AGE IN PERSPECTIVE

SPACE DIGEST

VOLUME 4, NUMBER 8 • AUGUST 1961

We're Going to the Moon . . . Does the Public Know Why?
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The urgency and implications of President Kennedy's call for a national commitment to place an American on the moon are *not* fully understood by the general public, warns a noted pioneer and prophet of the space age.

Biology's Stake in Astronautics
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Two distinguished scientists point out that biology could gain more from space exploration than any other major field of science, especially in terms of new understanding of the origin and nature of life.

Spaceman's Best Friend—the Chimp
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Close cousins to man, the chimpanzees at the Air Force's Aeromedical Field Laboratory at Holloman AFB, N. M., are supplying vital data to the stockpile of bioastronautical know-how needed to ensure man's safety in purposeful spaceflight.

Speaking of Space
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In the enthusiasm to build new facilities for the commendably accelerated national space effort, are we overlooking existing capabilities and courting the danger of diffusing our available talent?

Space-General Corporation combines the experience and capabilities of Aerojet's Spacecraft Division and Space Electronics Corporation into a new corporate entity which is dedicated to maximizing national progress in the exploration and utilization of the space environment. ■ Under the leadership of Dr. James Fletcher, President, and F. W. Lehan, Executive Vice President, Space-General Corporation will apply its capabilities to conceive and produce advanced ballistic missiles; launching vehicles; military, scientific and commercial space systems; space probes; and their component sub-systems.

To further enhance its capability, Space-General Corporation is now expanding its staff of able scientists and engineers. Those capable of bringing high levels of skill and energy to this growing organization will be considered, without regard to race, creed, color or national origin. Contact MR. PIERRE BROWN *at* SPACE-GENERAL CORPORATION, *777 Flower Street, Glendale, California.*

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A SUBSIDIARY OF AEROJET-GENERAL CORPORATION

The urgency and implications of President Kennedy's call for a national commitment to manned lunar exploration are not fully understood by Americans, warns Trevor Gardner, who has earned wide recognition as a prophet and pioneer of the space age. Mr. Gardner puts the question . . .

TREVOR GARDNER

We're Going to the Moon . . .

DOES THE PUBLIC KNOW WHY?

ACHIEVEMENTS in space have created a new international index of our nation's position in world leadership. Our allies, the uncommitted nations, and the emerging new nations watch this index. The USSR clearly recognizes this fact. The President of the United States also clearly recognizes this fact. He has recommended to the Congress that the United States establish a major national goal of landing a man on the moon and returning him safely to earth before the end of this decade.

What is not clear, however, is that the urgency and implications of achieving this goal are understood and accepted by all Americans. The total reaction of the United States to the challenge and opportunity of space in the three and one-half years since Sputnik I has been a sad and repetitious story of too little, too late. It is true that we have achieved some scientific and military progress but not enough to prevent great damage to our image of world leadership. Our recent successes do not materially alter these facts.

Unfortunately, our society has a consistent record of having underimagined the possibilities of the technological future, and of having underreacted to the ominous significance of Soviet technological and military progress—in nuclear and thermonuclear weapons, in military aviation, in intercontinental missiles, and in space developments. The President's [May 25] proposal for our future in space is a dramatic, necessary, and timely reversal of this trend.

This daring and courageous commitment by the President and his request for support by the people and the Congress is a clear recognition of the fact that in the field of science and technology a mortal struggle for supremacy and survival has long been in progress.

We all remember October 5, 1957—the day that the Soviet Sputnik I awakened the world to

the dawn of the space age. The reaction of many of our elected and appointed officials was confused and fragmentary. We were alarmed at President Eisenhower's casual reaction to Sputnik I—"It doesn't bother me one iota." Sputnik I was called a "bauble," and we were admonished not to compete in a space-age basketball game.

However, America's future in space had been assured by the Air Force intercontinental ballistic missile program under the leadership of Dr. John von Neumann, General Schriever, and Dr. Simon Ramo, and by the Army's Redstone program, under the leadership of Dr. von Braun. Many of us who had been associated with the ICBM development program since early 1953 had strong convictions that this first family of space vehicles was the immediate answer to Sputnik I and would add greatly to America's nuclear deterrent strength.

We were therefore exultant when, on December 17, 1957 (just a little over three years from the date of acceleration of the project), America's first operational intercontinental ballistic missile flew to full range and landed in the waters of the South Atlantic. Since then, the ballistic missile portion of our space activity has continued with phenomenal success. It now provides our nation with a vastly increased retaliatory power. Our military program also provides over ninety percent of the support for our civilian space experiments.

Our history in other space developments has been characterized and constrained by a cautious unimaginative approach—symbolized by the lack of development of big boosters. Even though President Eisenhower later clarified his meaning of the word "iota" by recommending a billion-dollar space budget to the Congress, we still continued to lag far behind the Soviets in the development of propulsion systems needed for the conquest of space. Our active and articulate budget planners crippled and halted this development, until finally in November 1960, under heavy pressure from the Congress, the President [Mr. Eisenhower] added sufficient funds to make a small beginning in the large chemical-booster field, and a miniscule beginning in the nuclear-propulsion field.

The fact still remains that we cannot talk, rationalize, or organize our way into space. We have to boost our way into space with a broad-based and imaginative, liquid, solid, and nuclear "crash" program in this field. This is the central and immediate technical urgency of the President's program.

Many of our military planners and scientists are opposed, for a variety of substantive and philosophical reasons, to committing the nation to a space race with the USSR. This has resulted not only in a drastic limitation on the scale and scope of our planning for space experiments and space exploration, but also has resulted in a serious limitation on military space developments. Even after the USSR has repeatedly demonstrated its ability to orbit a 10,000-pound satellite and land it at a time and place of its choosing, we still have no active satellite defense program beyond the paper planning stage.

I believe the general public reaction to the President's decision has been affirmative. However, the phenomenal success of the NASA suborbital flight experiment involving Commander

Shepard has tended to lull us into a state of relaxed euphoria concerning America's over-all position in the space race. This could prevent a complete endorsement of the President's proposal by the Congress.

The Gallup Poll, taken just before the President's message to Congress, states that only one person out of three was clearly in favor of a major lunar program. The question asked in the Gallup Poll was:

"It has been estimated that it will cost the United States roughly $40 billion total, or an approximate average of $225 per person, to send a man to the moon. Would you like to see this amount spent for this purpose?"

The results were: yes, thirty-three percent; no, fifty-eight percent; no opinion, nine percent.

These results were published *after* the President's speech almost as though they were a reaction to it. They were also based upon the false premise that the lunar project would cost $40 billion while the President's message asked for $7 to $9 billion additional over the next five years. In addition to the Gallup Poll, a number of newspaper commentators have questioned the benefits and wisdom of the project while overestimating the possible cost.

Fortunately, many members of the press understand that the lunar mission is a sensible national space goal since it is a space objective which we will achieve in time in any case and which, by being well planned and placed upon an urgent time schedule, can accelerate progress in vast areas of science and technology having civilian as well as vital military importance. It is also well recognized by all that achieving the lunar landing after the USSR would seriously damage our prestige.

It is important that we understand the general value of lunar exploration so that it will be manifestly clear that we are not just buying a "stunt" for many billions of dollars, but rather are undertaking the first in a series of events which will have a profound effect upon the course of human history. It is entirely possible that in two or three decades, the scientific, economic, technological, and military importance of the moon will cause us to consider it as valuable as certain pieces of real estate on earth over which major wars have been fought or over which disputes are presently pending.

The lunar project is a natural focus for vast space activity. In order to achieve a manned lunar landing and return, certain basic space capabilities must be developed. These are the same capabilities which are required for a large-scale military, scientific, and technological utilization of space. They are principally:

- Ability to orbit, maneuver, rendezvous, deorbit, reenter, and land.
- The building of space stations and the support of manned occupancy.
- Sustained manned spaceflight.
- Guidance, navigation, and communication systems necessary for large-scale space operations.
- Development of standardized launching techniques and launch vehicles. This will greatly decrease cost of space operations.

All of these capabilities are military necessities and vital to our national security.

The lunar project will automatically result in the early attainment of certain achievements, some of which may be "firsts"—most of which will have high prestige value. They are:

- Sustained manned orbital flight, and controlled reentry.
- Demonstration of rendezvous with physical contact.
- Use of men in spacesuits working outside of orbiting space vehicles.
- Detailed high-resolution photography of lunar surface.
- Unmanned lunar soft landing.
- Unmanned lunar soft landing with lunar surface samples returned to earth.
- Manned circumlunar flight.

The capabilities needed for the lunar mission also provide the basis for true scientific space exploration. The accelerated lunar project will increase the rate at which scientific information is obtained from a study of the moon's environment, surface, and subsurface. The surface environment of the moon, while hostile, is quite unique and makes the surface of the moon valuable as a base for scientific observations other than the study of the moon itself. A lunar scientific laboratory will be an invaluable resource for increasing man's knowledge of the universe.

It is difficult to assess the technological or economic value of the moon. In general, certain properties of the moon appear likely to be of significant importance in the expansion of our technology:

- Low surface gravity—of particular importance for using the moon as a base of space operations.
- Near-vacuum conditions — important for space operations and vacuum technology.

Technological possibilities that may exist are:

- The placement of masses of rocket propel-

lant, produced on the moon, in various orbits crossing cislunar space as a means of drastically reducing the cost of space operations.

- Construction of very large, high-current particle accelerators on the moon's surface, for large-scale production of isotopes, including plutonium and U-233.
- Large-scale production of new materials requiring near-vacuum pressures for production.
- Construction of space vehicles for very large-scale exploration of deep space.

A variety of general benefits will result from space operations and the accelerated technology resulting therefrom. Service satellites will render new services to the entire world. These services are: improved meteorological information; navigation; public communication; international television; arms control communications; and scientific experiments such as instrumented deep-space probes or a manned or unmanned satellite observatory.

Already in the process of exploring outer space, many practical by-products of scientific and technological research have emerged. More are on the way. These range from infrared food blanching to woven stainless-steel cloth and advanced transistors.

The new power sources being developed for space use already seem to have many applications on earth. In the not-too-distant future, our ability to use and store solar energy and to build small nuclear-power supplies will find applications throughout the world. Additional examples are improved protective clothing, improved plastic fabrics, more efficient and longer-lived lubricants, stronger and more versatile adhesives.

The earthly by-products of the lunar adventure will clearly be numerous. Their value to mankind, while now only dimly envisioned, may alone justify the cost.

Cost estimates for this project having a reasonable degree of reliability are impossible at this time. A variety of estimates exist. Cost is affected by the choice of propulsion system, option to stage from satellites, the number of passengers to be carried in the first expedition, and the number of miscalculations or mistakes which we make. Estimates made by responsible individuals and groups have ranged from $3 billion to approximately $10 billion. Other responsible individuals and groups, who have studied the subject only in a cursory manner, have tended to double or quadruple these estimates.

It seems more probable that the lunar landing and return mission can be accomplished for approximately $10 billion, rather than $40 billion. It should be noted that we are already proceeding with a military and civilian space program which spends approximately $2 billion per year. It may well be that these funds will be spent more efficiently as a result of the focus on the lunar mission. The opportunities, challenges, and demands of the space era appear to require not $2 billion a year but a $5 billion a year space program by about fiscal 1964.

These sums seem large, but for a nation whose gross national product is $500-plus billion and going up, it is approximately one percent of the GNP. Much of this cash will be regenerative and not just "wasted." This covers not only the down payment but also the progress payments required to reach into this vast new frontier at a rate limited only by the imagination and genius of our scientists, technologists, and managers.

Perhaps a more relevant observation is that a nation which spends some $40 billion a year for amusements, and some $11 billion a year on advertising of its amusements and products, clearly has the resources to support a major space program. By no stretch of the imagination can it be argued that a major space program is a more trivial enterprise or one less certain to produce lasting satisfactions than either of these "sinks" for our excess energy and wealth.

We should clearly recognize, however, that our investment in space activities has to be "additive" to our investment in other areas of national security, such as Polaris missiles, intercontinental ballistic missiles, limited war forces, foreign aid, strategic nuclear airpower, anti-ICBM, and space defense systems. This is the unhappy reality of our time.

There is little reason for being appalled by the sheer magnitude of the effort required to develop a major space exploration capability. Many examples exist in history of massive endeavors which were very much more prodigal and consumed a far greater fraction of available energy and resources than will be required in the proposed lunar program.

Compared with the major explorations of history, it is clear that the exploration of the moon, and later the planets, will dwarf all others—the great military explorations of Alexander the Great, Hannibal, Caesar, and Genghis Khan, as well as the civilian explorations of Columbus, Cabot, Darwin, and Amundsen, will be overshadowed in historic importance.

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Why the Agena B gives America more orbits for the money

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MISSILES & SPACE DIVISION, SUNNYVALE, CALIFORNIA

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At Northrop a special task force has been assigned to explore the complex technical problems involved and come up with practical recommendations. They are giving particular attention to such areas as the design of a general shuttle vehicle, close-in rendezvous and docking techniques, requirements for manned maintenance at all levels, and methods for transfer of men, materials and equipment under conditions of weightlessness.

Not all the problems are solved yet, even on paper. But a surprising number of practical answers have been found. That's Northrop's special strength . . . finding realistic answers to the problems of the space age, and translating them into working hardware.

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None of the recent scientific and technological enterprises—atomic bomb, hydrogen bomb, nuclear-powered submarine, Polaris submarine, liquid ICBM, and Minuteman—compare in magnitude and complexity with the proposed lunar program. It is for this reason that the President has specified that we must marshal our scientific and technological resources and manage them with great skill in order to achieve success on a schedule which the ingenuity of the scientists of the USSR has already established for us.

In this connection, we should recall the inadequacy of the planning, funding, and execution of our first space satellite, Project Vanguard. It is painful now to recall the prestige cost of the repeated failures of this, our first venture into space. We dare not permit a repeat performance.

The paramount need of the accelerated lunar program was the President's decision to proceed. This decision, when approved by the Congress, will quickly result in a chain reaction of urgencies which must be satisfied. Underlying all of these, there is the necessity, not only to succeed in an extremely difficult task, but to succeed ahead of the USSR. Since our society is an open one, and since the Soviets do not seem likely to join with us in an international lunar program, they will have two principal advantages should they select an early lunar landing as their objectives. These are:

- Their important lead in large boosters, and
- Their Iron Curtain secrecy.

The concept of concurrency so well developed in the Atlas, Titan, and Minuteman, will have to be exploited to the fullest. It will be necessary to embark upon parallel approaches to many problems. Management will have to be alert that duplication is purposeful and not wasteful, but duplication to "buy time" will be required.

Because of the international interest in this massive national adventure, the support of the American people and of congressional committees is of the utmost importance. In the past, congressional committees have greatly assisted executive management in the execution of difficult tasks. This pattern must be repeated in the case of the lunar program. A special lunar exploration joint committee of the Congress seems warranted.

The degree of difficulty of the problem forces immediate concern with the vital details of the precise management techniques, management organization, and the quality of scientific personnel which the government will select for execution of the program. This management problem cannot be deferred or submerged by our complicated and separate space and missile organizations.

Only the most streamlined management channels, centralization of authority (technical, operational, and procurement), absence of "kibitzing" by *ad hoc* groups, and the application of our proven management resources developed in the nuclear and missile programs, can ensure success.

While undoubtedly the program will develop a new group of scientists and managers of unique competence, my general confidence level in the project would be increased if I knew that the management talents of professionals with a record of success on technically difficult programs will be fully utilized. For example, the program is vital enough to fully utilize the training, experience, and genius of both such men as Gen. Bernard A. Schriever and Adm. "Red" Raborn. Scientifically, the problem is complex enough to warrant the best talents of the late, great Dr. John von Neumann, Dr. Albert Einstein, and Dr. Enrico Fermi. We must seek out their living counterparts for this program.

We must architect the management structure and its scientific, military, and industrial support with the most sensitive artistry. Otherwise, we may find ourselves in the position that we would have been in had we tried to invent the atomic bomb with just the bureaucratic entity of the Atomic Energy Commission, devoid of the wisdom, intellectual leadership, and dedication of Oppenheimer, Einstein, Fermi, Kistiakowsky, Bethe, Teller, Szilard, Lauritsen, Von Neumann, and Ulam.

Using a vigorous program of space activities as a backdrop, the USSR seeks to demonstrate that their political and economic system is superior to ours, that their military capability is superior to ours, and that the power and vitality of the Communist state is superior to ours. President Kennedy's space program, as proposed to the Congress on May 25, 1961, is our nation's answer to the Soviet challenge.—END

An outspoken exponent of technological advancement as a tool of national security and national prestige, now Chairman of the Board and President of the Hycon Manufacturing Co., Trevor Gardner is a former Assistant Secretary of the Air Force. The above article is a condensed version of his June 13, 1961, address to the joint meeting in Los Angeles of the American Rocket Society and the Institute of the Aerospace Sciences.

TYPICAL MULTI-CHANNEL MEMORY UNIT *

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allows realistic simulation of longer range and lower altitude tactical training missions

Based on a major technical breakthrough in information storage, Marquardt's new bombardier/navigator radar trainer system provides outstanding simulation characteristics. The flexibility and capacity of the Multi-Channel Memory—a high density storage medium—make possible realistic simulation systems capable of meeting the advancing speed, range, and altitude requirements of aero-space technology.

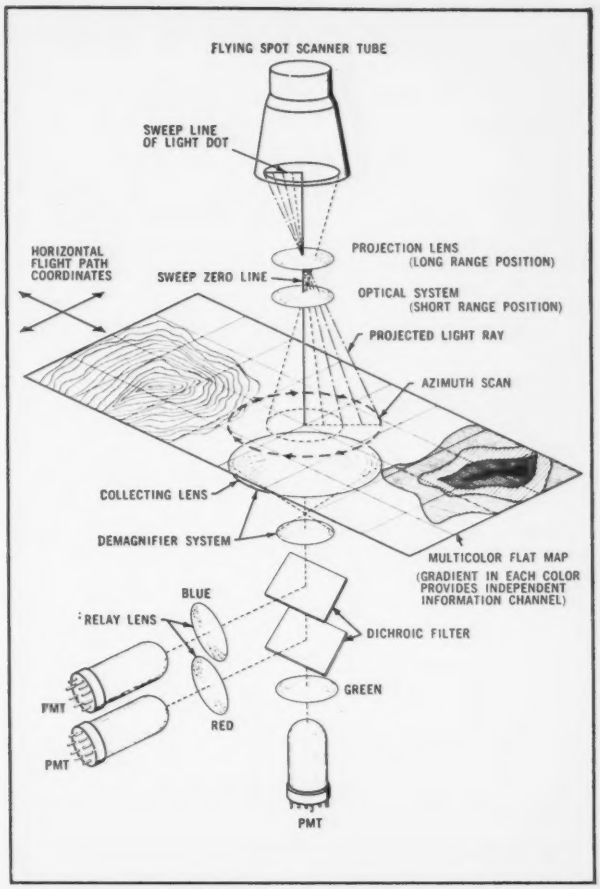
The Multi-Channel Memory uses a three color film transparency in which terrain information and radar reflectivity data are stored on a map scale ratio of three million to one, or better. A highly detailed terrain map representing a land mass area 2,000 miles by 3,000 miles can be permanently stored on a slide only 48 inches by 72 inches. Because the map transparency is flat and terrain elevations are reproduced electro-optically, there are no physical limitations to its use. The system is particularly well suited for very low altitude simulation.

Information in the Multi-Channel Memory System is coded as varying densities of the three colors of the film transparency. During operation the transparent map is scanned by a flying spot scanner. After passing through the film the light is separated into various channels by filters and mirrors and converted to electronic signals by photomultiplier tubes. The light intensity in each channel is dependent upon the absorption of the corresponding color dye in the film. The signals are then processed by a high speed computer and displayed on the face of the PPI (plan-position-indicator) radar display.

Because of its flexibility and large storage capacity, the Multi-Channel Memory System has application to missile and space training problems, information storage and retrieval, automatic language translation, advanced command and control systems, and similar computer uses.

The bombardier/navigator training system mentioned above, and now being developed for the Air Force, is the result of more than ten years of experience in the development and manufacture of trainers and simulators. Marquardt has successfully produced, installed and maintained world-wide—on time and at low cost—bombing and navigation trainers, gunnery radar trainers, AEW/CIC trainers, special purpose trainers, and ground control intercept trainers. For information concerning Marquardt's training and simulation systems capabilities, contact William Lord, Pomona Division, The Marquardt Corporation, Pomona, California.

Scientists and engineers experienced in the fields of simulation and training systems are invited to investigate exceptional career opportunities with The Marquardt Corporation. All qualified applicants will receive consideration regardless of race, creed, color, or national origin.



DATA EXTRACTION FROM COLOR TRANSPARENCY
The principle of land mass simulation storage and readout is shown above. Terrain elevation and radar reflectivity are coded as varying densities of the three colors of a color film transparency. As the light source simulates airborne radar scan, signals are generated by the photomultipliers to provide information necessary to simulate a radar presentation.

★ MULTI-CHANNEL MEMORY UNIT
Shown on the opposite page is the heart of the Multi-Channel Memory System — a three color film transparency. Each color provides a permanent and separate information channel in perfect register at any point no matter how large the map.

THE Marquardt CORPORATION

CORPORATE OFFICES, VAN NUYS, CALIFORNIA

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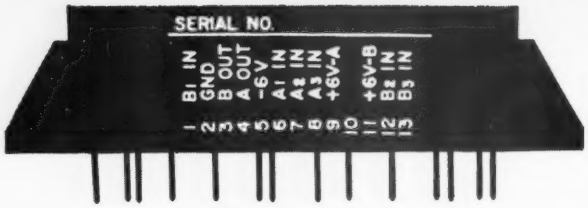

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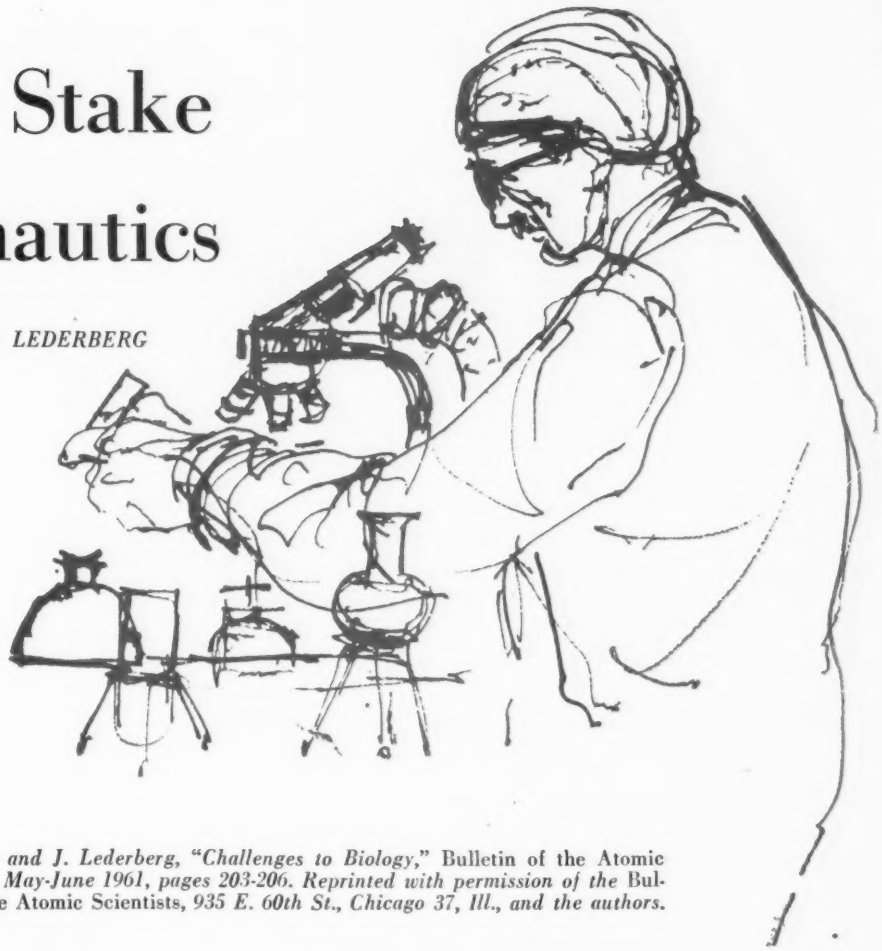
Advances in rocketry and the possibility of exploring other celestial bodies offer important potential advantages to the science of biology in its search for the secrets of the origin of life and an answer to the question: Is life a condition to be found in the universe where environmental factors are available? . . .

Biology's Stake in Astronautics

AARON NOVICK and JOSHUA LEDERBERG



A. Novick and J. Lederberg, "Challenges to Biology," Bulletin of the Atomic Scientists, *May-June 1961, pages 203-206. Reprinted with permission of the* Bulletin of the Atomic Scientists, *935 E. 60th St., Chicago 37, Ill., and the authors.*

IN ORDER to ask whether life occurs on another planet we must provide ourselves with a definition of "life." The consensus so far, derived from our knowledge of earth life, is that any definition must be arbitrary; that is, if life has gradually evolved from inanimate matter, the demarcation between living and nonliving is a matter of judgment. Many biologists seek a convenient working definition of life in the fact that life exhibits a unique capacity to become more complex with time, *i.e.*, to evolve. A system to be described as alive must be able not only to reproduce itself but also to mutate, *i.e.*, to undergo randomly introduced alterations which are then reproduced. In any particular environment, individuals having certain combinations of characteristics will reproduce more rapidly than others and thus predominate. In time the species will have altered, adapting to the environment—which is evolution. The complexity that individuals can achieve is determined by the range of possible mutations, and if the range itself can be increased by mutation there are no foreseeable limits to the complexity that can be reached.

In the last few decades we have learned that

all life on earth has fundamentally the same chemical basis. All forms of earth life depend upon an aqueous environment, and on moderate temperatures that permit organic macromolecules to be reasonably stable. Furthermore, they are all composed of similar molecules. We now know that two of these, the nucleic acids and the proteins, account for the most basic activities we associate with life. The proteins serve as specific catalysts, directing cellular chemical reactions that produce the chemical substances needed for growth. Proteins are constructed of relatively small subunits called amino acids, of which there are twenty different kinds, arranged somewhat like links in a chain. A typical protein may be composed of several hundred amino acid units ordered in a sequence specific for this protein.

Any organism must be able to make thousands of different protein molecules, and it derives information for their structures from its genetic endowment. It is now known that desoxyribonucleic acid (called DNA) forms the essential chemical basis of this endowment. DNA has the remarkable property of being able to contain information to duplicate itself. From its structure, discovered by Watson and Crick, and from experimental studies, it is becoming apparent how DNA can carry out these functions. It is made up of four different subunits (nucleotides), with hundreds of nucleotides forming a long chain. It is believed that the arrangement of the four different types of nucleotides in a particular nucleic acid determines by some coding relationship the arrangement of amino acids in a particular protein. Furthermore, the DNA molecule is built of two complementary long nucleotide chains wound about each other; the sequence in one chain determining the sequence in the other. It is believed that each chain of a pair provides information for the formation of a new complementary chain; thus one pair of chains can make two pairs.

Mutation can occur if a wrong nucleotide is put in at some point. Such a change would lead to an alteration in the protein specified by this nucleic acid and would be perpetuated in the progeny. This relationship between nucleic acids and proteins forms the basis of all known earth life, and the discovery of this relationship is a major triumph of biology. But much remains to be learned of the actual chemical mechanisms involved.

The origin of life has been the subject of much thought since the earliest speculations of man. A major early milestone in the development of biology was the demonstration that the suspected cases of spontaneous generation of life from inanimate matter were false and that recognizable life apparently always develops from an earlier parent. This led to the idea that prevailed for many years that life had its origin on earth in some extremely unlikely accident.

But more recent ideas have lent encouragement to the belief that there is a good, rather than unlikely, chance for life to develop on a planet like earth. It was argued that spontaneous chemical processes would lead to the formation of many complex molecules. In fact, amino acids are formed by the action of electric discharges on gas mixtures similar in composition to the presumed primitive atmosphere of earth. In the absence of voracious organisms such complex compounds would accumulate, especially in the oceans where they would be protected from the decomposing action of solar radiation. In this "soup" there could develop self-replicating structures that would catalyze their own formation. How this might have happened is not yet understood in any detail but we are beginning to visualize the essential conditions for chemical replication. Much is being learned from biochemical studies of nucleic acids and from industrial syntheses of stereo-specific polymers. It is possible that ancient rocks may yield "chemical fossils" from this early period in the evolution of life on earth which would help

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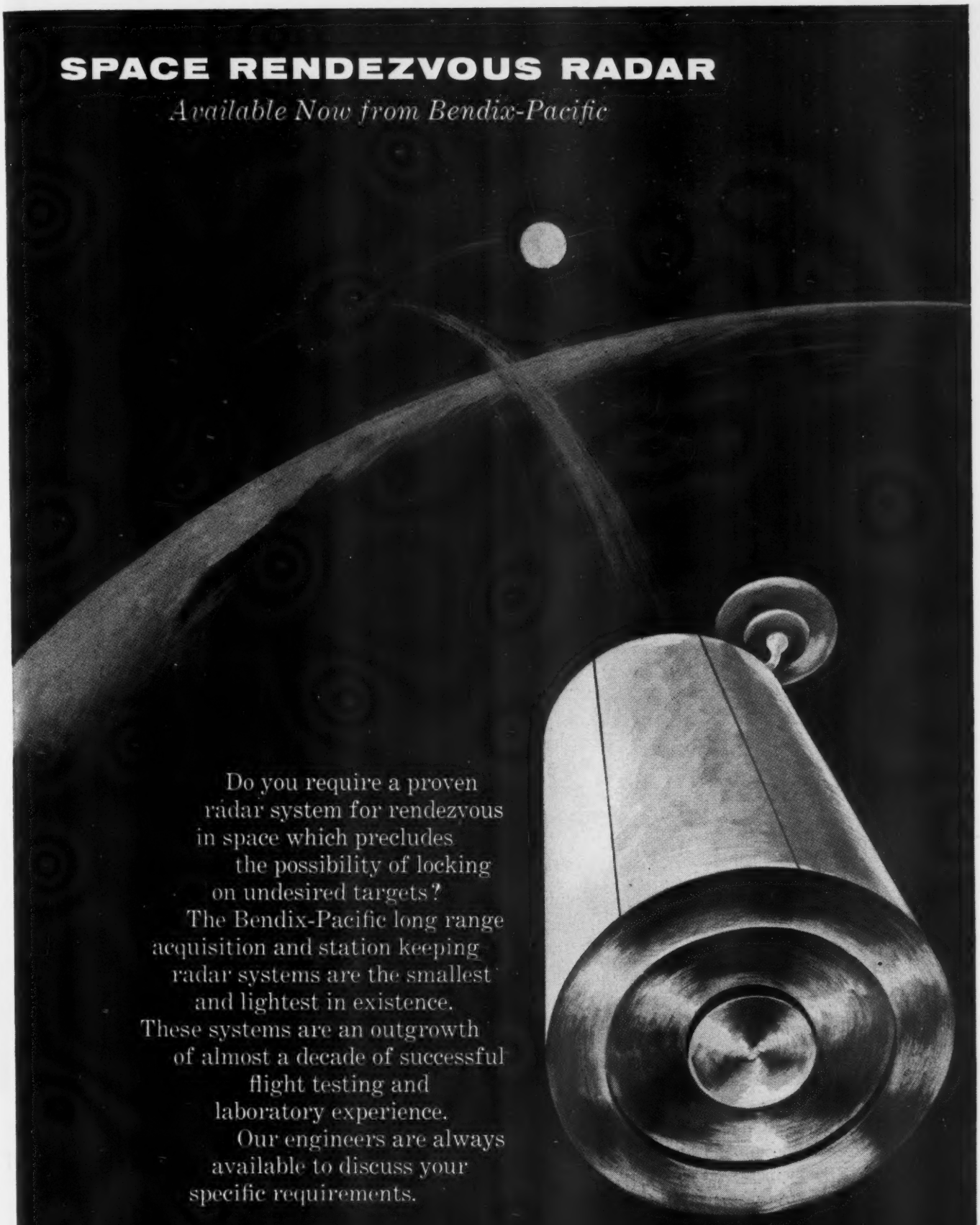

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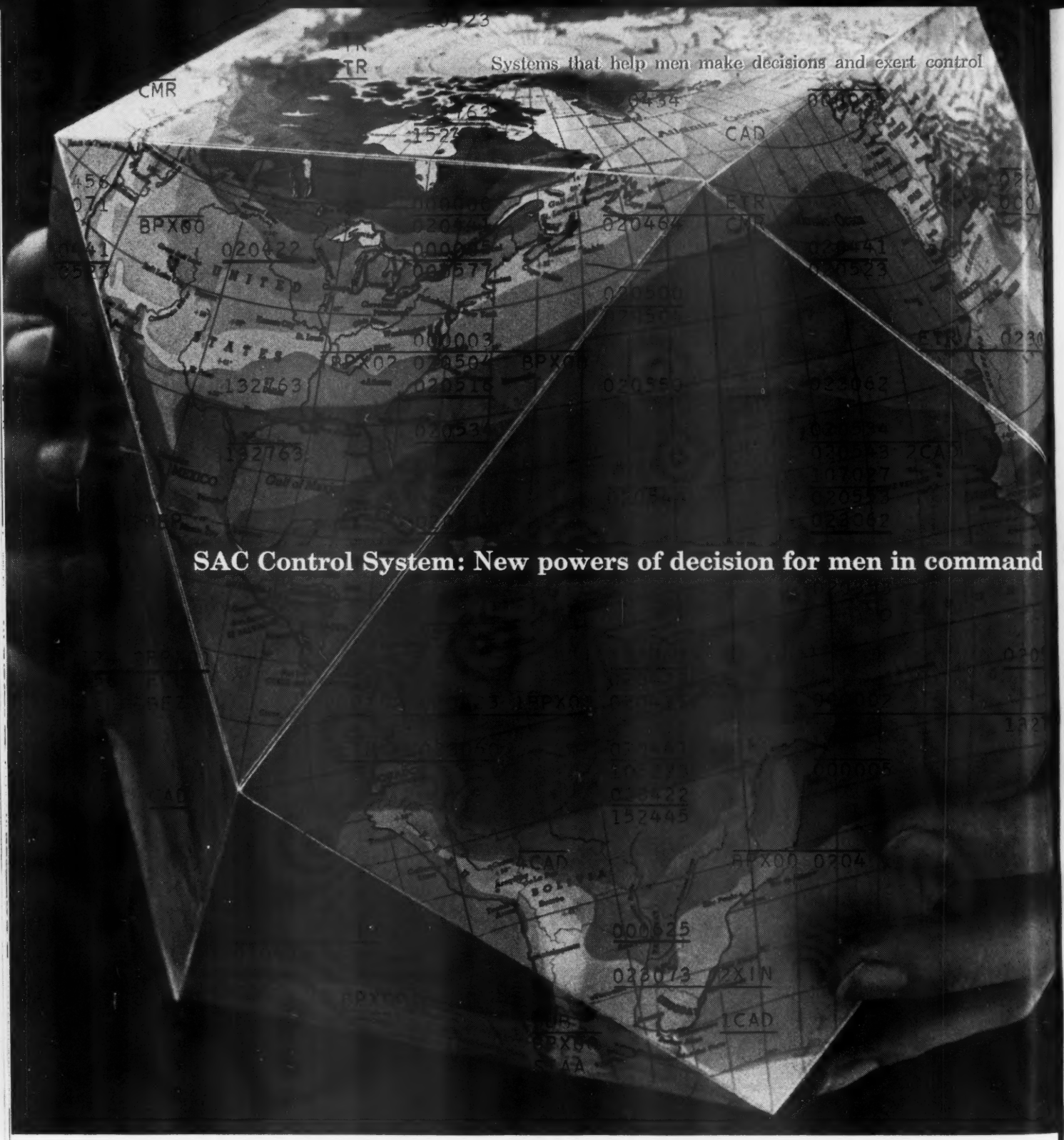

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The globe shown is the Dymaxion projection by R. Buckminster Fuller. It depicts the spherical world as a flat surface with a minimum of distortion.

toward an understanding. Probably, these will be hard to find since most such relics have been destroyed on the earth's surface by later occurring life and beneath the surface by the action of high pressures and temperatures.

One intriguing theory of the orgin of life, which now seems less credible but which is difficult to rule out completely, is the hypothesis of panspermia advanced by the physical chemist Svante Arrhenius. He suggested that life originated on earth through the migration of spores to earth from some other planet. But it is difficult to account for the escape of a spore from a planet, and the idea that light pressure could give sufficient velocity to permit escape from the gravitational field of a planet as large as earth or any planet large enough to sustain a significant atmosphere is implausible except for objects the size of the smallest viruses. Moreover, assuming that a spore did escape from a planet, the intense solar radiation prevailing in the absence of a protecting atmosphere would destroy it in a tiny fraction of the time required to go from one planet to another. Finally, the hypothesis of panspermia only defers the problem of the origin of life to some unknown site. Nevertheless, considering future developments in rocketry, it would not be wise to rule out completely the possibility of an artificial panspermia where life itself evolves the means of making an interplanetary voyage.

From our present understanding of terrestrial life we can deduce some minimal conditions for life of any kind to exist. There must be a chemical system in an environment where large information-bearing molecules are stable; and in addition there must be a source of energy and a source of chemical raw materials in order that the information-bearing molecules can duplicate themselves. Further, the development of life would almost certainly depend on the presence of a liquid solvent like water in which chemical reactions would proceed far more rapidly than they would in the dry state.

On the basis of this picture of earth life and of the mechanism of its origin, the biologist has many questions he would like to ask. Principally, of course, he wants to know whether life exists outside the earth. Should any be discovered, the biologist's first wish would be to gain an understanding of the chemical basis of this life. Does it, like earth life, use the protein-nucleic acid system? If not, what chemical systems are used for information storage and catalysis? Along with the search of life there is the additional important objective of finding, through studies of the chemistry of planetary surfaces, evidence that might help us understand better the chemical evolution which led to the appearance of life on earth.

Early missions will have severe limits on the weight of experimental apparatus that they can carry and on the amount of information that they can return to earth. It will have to be decided whether to gamble for a quick answer with a "long-shot" experiment or use the early space probes for gathering more precise and certain information as a basis for the design of more sophisticated experiments. It does appear, however, that a popular choice for an early mission making a "soft landing" will be a visual examination of the surface of a planet. It is a thrilling prospect to examine close-up photographs of the surface of a planet like Mars, and such pictures should also serve as valuable guides for the design of later experiments. With great luck a close-up might give convincing evidence of Martian life. Along with chemical stains which give specific colors with substances like nucleic acid and protein, this photographic equipment could also be used to identify the chemical basis of any life that might be discovered. Moreover, such stains, when employed with a microscope, might permit the detection of small organisms that otherwise could escape notice.

Of the nearby planets Mars offers the best chance of finding life. Although water and oxygen are scarce, the range of temperatures on Mars is moderate; and in fact, there are a number of earth micro-organisms which would certainly be able to survive in the Martian environment. Whether they could actively proliferate will probably depend on the local availability of moisture; obviously a map of Martian humidity would be a crucial objective of early exploration, as water may be the most prized mineral on the planet.

There is a long record of speculation on whether or not life exists on Mars. Much of the evidence has been at best only suggestive. Recent observations of the infrared reflection spectrum of Mars appear to indicate the presence of C-H molecules in the dark areas, materials whose abundance seems to vary with the seasons. An urgent objective is the further study of this phenomenon, and a probe to the near vicinity of Mars could provide crucial data unobtainable from earth.

Venus seems less likely to contain a recognizable form of life. Its surface temperature is apparently higher than the boiling point of water, according to indirect determinations from radio

wave measurements. However, as in the case of Mars, it would be intemperate to make dogmatic conclusions until we have mapped the planet in more detail. In the case of Venus, with its dense atmosphere, a three-dimentional map of temperature and moisture is needed to indicate the zones where life might exist.

The moon, barren of atmosphere, appears unlikely to harbor life. But we know nothing of the conditions below its exposed surface.

The moon may be especially interesting as a gravitational trap for meteoroidal material accumulated from space over many eons, unaltered by the action of atmosphere. The earth is the most likely source of such material; and should terrestrial material be identified on the moon, it would furnish strong support for the hypothesis of panspermia. Mercury appears much like the moon physically. Its dark side, perpetually free from the corroding effects of the solar radiation, may be a far better repository of meteoroidal material than the moon, although its distance makes it a less likely target.

The large planets are too distant for early examination, but they are not without interest. Conditions there would favor the accumulation of organic material. Compounds formed in the chemically reactive conditions of the upper atmosphere would descend to lower altitudes where they would be shielded by the atmosphere from decomposition by the solar radiation. It has been calculated that by now enormous quantities of carbon compounds have accumulated on the large planets.

Like all advances in human technology, space exploration may create new problems for mankind; and the biologist must be prepared to contribute toward minimizing them. One source of concern can already be anticipated. A consequence of our ability to send vehicles to other planets is the infection of these planets with earth life. A probe, for example, could introduce microbial life onto a planet; and if there were nothing to limit growth, the organisms could occupy the entire planet in days or weeks. By the time a later probe was sent it would be too late to study the planet in its virgin condition, denying us an inestimable prize for the understanding of our own life and its origins. Moreover, we cannot exclude the possibility that such a catastrophe would have economic repercussions as well; it would be rash to predict too narrowly the ways in which undisturbed planetary surfaces might serve human needs. Also we must face the conceivable moral problems raised by the thought of our contaminating an already inhabited planet.

Fortunately, the responsible agencies in the US and in the USSR have recognized this problem and will insist that due precautions be taken on planetary missions. Vigorous methods of decontamination of spacecraft, principally by gaseous fumigation, are being developed. A conservative policy can do no harm, and caution need not preclude enthusiastic exploration.

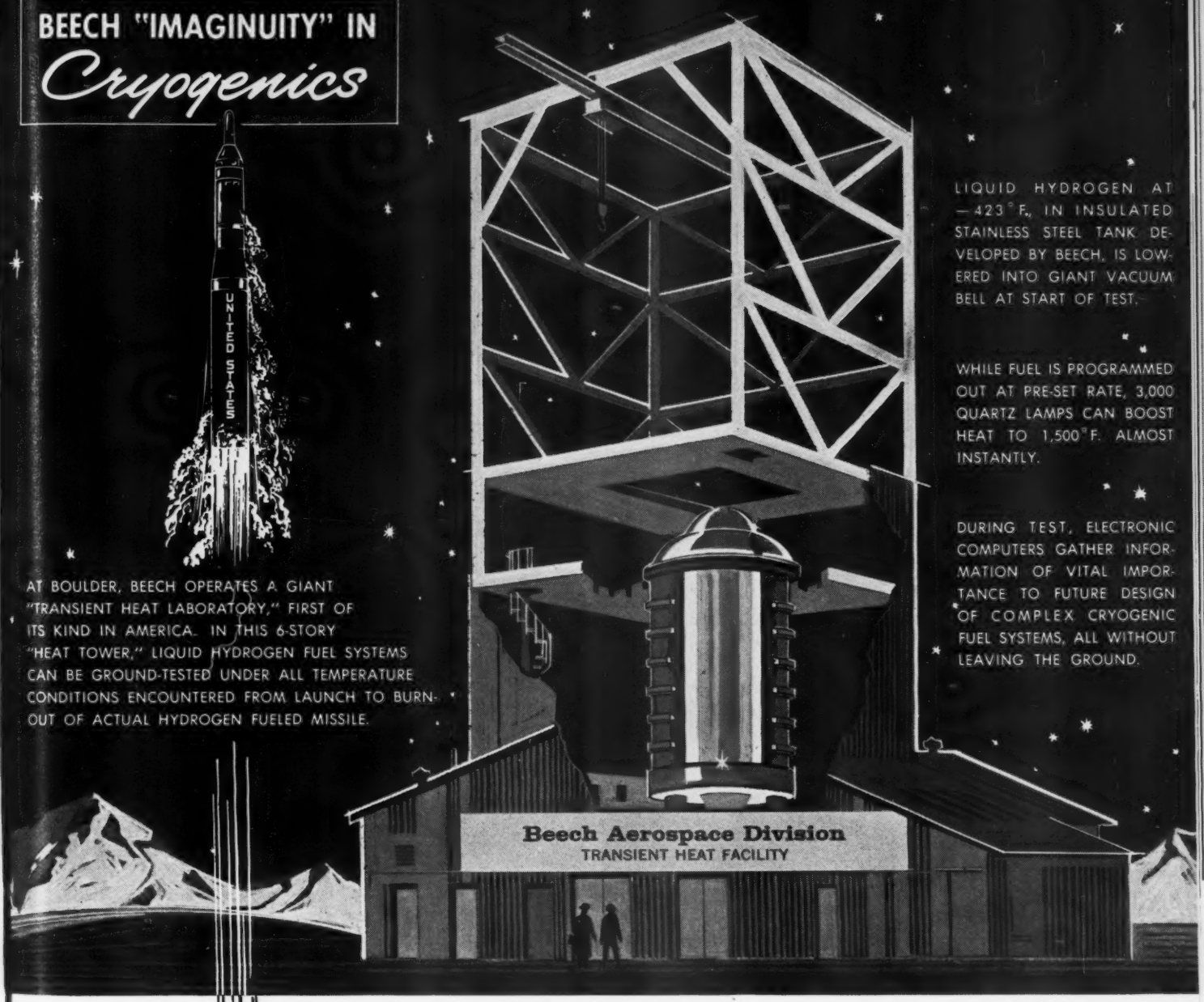
By the next decade vehicles may be making round trips to the planets, and we must reckon with the bizarre possibility that the returning vehicles may infect earth with life from some other planet. Since the very existence of extraterrestrial life is still speculative, we can only surmise what such back contamination might mean. There could be new plant or animal diseases. If nothing more, we could imagine serious competition for some essential resource from a life form of extraterrestrial origin. The probabilities of these occurrences cannot be guessed. We must protect ourselves, however, by designing and sending automatic instruments that will return information without the peril of invasion of earth by some strange organism. In time, with more information on conditions on other planets, we will have a far better basis for deciding on the advisability of bringing materials from other planets to the earth.

For the biologist, space research is a gamble against high odds for higher stakes. The experiments are difficult to design, requiring years of preparation, and very likely the result will be negative. But there is the tantalizing prospect of finding answers to some of the oldest and most basic questions of biology. It can be argued that biology could gain more from space exploration than any other major field of science. At the same time, the biologist has a unique and grave responsibility to consider the implications of space exploration for human welfare.—END

Aaron Novick is a noted biophysicist at the Institute of Molecular Biology at the University of Oregon. Joshua Lederberg, who is Professor of Genetics and Biology at the Stanford University School of Medicine, has made important contributions to biology and the question of the origin of life, and was awarded a Nobel Prize in physiology and medicine in 1958 for research in the genetics of bacteria. This article is condensed from the May-June Bulletin of the Atomic Scientists.

BEECH "IMAGINUITY" IN *Cryogenics*

AT BOULDER, BEECH OPERATES A GIANT "TRANSIENT HEAT LABORATORY," FIRST OF ITS KIND IN AMERICA. IN THIS 6-STORY "HEAT TOWER," LIQUID HYDROGEN FUEL SYSTEMS CAN BE GROUND-TESTED UNDER ALL TEMPERATURE CONDITIONS ENCOUNTERED FROM LAUNCH TO BURN-OUT OF ACTUAL HYDROGEN FUELED MISSILE.



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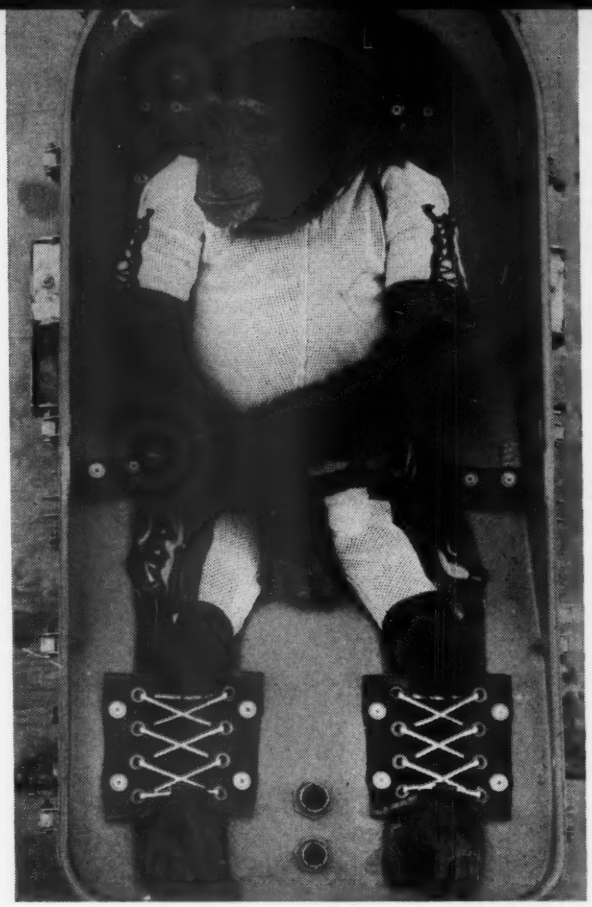
May we help you? Write, wire or phone Roy H. McGregor, Manager, Contract Administration, Beech Aircraft Corp., Wichita 1, Kansas—or nearest Area Office.

FRANK GIUSTI

Closely akin to man, the chimpanzee is serving as hardy and bright pioneer in astronautics, learning his space-age lessons at the Air Force's Aeromedical Field Laboratory, Holloman AFB, N. M., site of a unique animal facility where the simian élite is trained for space tasks, such as Project Mercury, by expert USAF biomedical personnel . . .

Lt. William Ward, Capt. Grover Schock "briefing" simian on some performance tasks he must achieve.

—US Air Force photo



—US Air Force photo

America's favorite chimp, Holloman's Ham, in padded contour couch of type that took him on his space ride.

Spaceman's Be

THE CHIMP is the most likely and logical member of the animal kingdom to help man master space. In body and behavior, in moods and motor ability, he is more closely akin to man than any other creature. Or, as the biologists would put it, he is the highest on the polygenetic scale, which is why these animals are so amusing in zoos and circuses where they ride bikes and roller skate, don and remove their clothes, eat daintily at table with spoon and fork, even puff on cigarettes.

Just as the chimp bears a resemblance to man in behavior, so does he possess certain physiological similarities—in patterns of the brain, makeup of the blood, and structure of the hands, for example. Like man, he has his good days and his bad, his bright and bleak periods. He may bubble with fun one day and sulk the next, even though his apparent physical condition is the same. He will scrap angrily with a playmate, then smother him with affection. He can be cooperative and stubborn by turns, just like a child. He is alert,

—US Air Force photo

Daily physical checkup is routine. Lt. Eldon Miksch, caretaker Manuel Monrreal do the job for this fellow.

—US Air Force photo

The reward for good performance is food and drink. Here a space chimp takes time out to wet his whistle.

Best Friend— the Chimp

curious, excitable; a superb mimic, excellent visual memorizer, and a creature quickly skilled at mechanical tasks.

If a dog or rat is confined in a small space from which it can escape only by utilizing a certain mechanism, it will make aimless efforts to free itself until it stumbles on the right lever by chance. When it is put to the test a second or third time, memory comes to its aid and it quickly releases itself. It thus acts out of instinct and experience. But the chimpanzee, given a similar challenge, uses his head, his innate intelligence. After a few fruitless attempts to get out, he may stop, sit down quietly, and then suddenly utter a little cry. He has solved his problem through a form of reason.

Because he is like man in so many ways, the chimpanzee can be expected to manifest reactions similar to those man might display under comparable environment and stimuli. The alien medium of outer space is an example. How a chimpanzee reacts in space may well suggest how man would react there. How a chimp performs certain tasks in space may give us an idea of a man's capabilities in the same medium.

A living organism, including man, can survive in space if protected with adequate life-support equipment. Of that the scientists are certain. What they are not so sure about is how well he can function as a useful and effective part of a spatial mission.

For help in supplying the answers to [such] questions, space scientists have turned to the animal most like man. And the chimp is cooperating readily and responding warmly to his space-age role, if one can judge by the performance of an élite colony of chimpanzees doing research duty in the sun-baked desert of southern New Mexico. These eggheads of the ape fraternity are undergoing a full-dress program of conditioning, testing, and training at the Air Force Missile Development Center's Aeromedical Field Laboratory at Holloman Air Force Base, which functions under the Air Force Systems Command.

This is where Ham, the first astrochimp, was taught to perform the lever-pressing tasks he accomplished flawlessly as he whooshed through space some months ago. This is where his brothers and sisters—Petunia, Vinegar, Big Ears, and all the rest—are being groomed for new assignments, both in space and on the ground, in support of Project Mercury.

The Holloman specimens, about forty-five in number, are put through their paces in a variety of devices that simulate the challenges and conditions men will face in outer space. Laced into nylon-web suits, they apply themselves to exercise in restraint chairs, contour couches, test and environmental chambers, mockup space capsules,

—US Air Force photo

Chimps get a carefully balanced diet they like. Bananas are perennial favorite. They like fruit juice, too.

and high-speed sleds. Their every performance is carefully recorded, evaluated, and correlated.

Off the job, they are given equally close attention, not only because, like humans, they acquit themselves best when they are in top physical shape, but also because a step-by-step observation of their physiology is essential to the behavior studies that will lead to an understanding of how man will be influenced by the hostile milieu of space.

They are coddled and coaxed, pampered and protected like the prize pupils they are. Their diets are carefully supervised, their health nurtured with daily doses of vitamins and minerals. Even the amount of water they drink is measured regularly. Each animal gets a daily medical checkup, and every three months he is given a complete physical examination.

Such thorough care, catalogued so completely, is conferred on few humans, let alone animals. Under the knowing ministrations of doctors, technicians, and attendants, all of whom develop a real attachment to them, the chimpanzees achieve high proficiency in tasks performed on light and lever devices that test their ability to respond, through a reasoning capacity not unlike man's, to patterns of stimuli.

Ham, astrochimp Number One, worked at such an apparatus on the recent flight that won him global notice, faultlessly pressing levers in response to red, white, and blue signals as his capsule traveled through space at speeds up to 5,800 miles an hour. Had he made incorrect responses, he would have received mild electrical shocks through the soles of his feet.

The red light remained on throughout the flight. Ham knew this meant he had to depress the right lever at least once every twenty seconds to avoid a shock. If he did so, the white light would flash. Every two minutes, the blue light came on. This told him he should strike the left-hand lever within five seconds to turn off the blue light and avoid a shock.

What such exercises have to do with man in space is explained in this way by Maj. Frederick H. Rohles, chief of the Aeromedical Field Laboratory's comparative psychology branch.

"What Ham was actually doing was performing a greatly simplified version of the tasks required of a man in space. The test was designed to show what he could do, and how well, during launch, weightlessness, and reentry, and to find out what physiological and behavioral effects he would experience as a clue to how a man would react to the environmental insults he would be subjected to in spaceflight."

Where Ham had only one program to cope with during his few minutes in space, some of the chimps who go up on future missions will be faced with as many as four, each appearing on the panel in sequence and each calling for different responses within specified periods to varying light signals.

At Holloman, a number of animals are now going through training in the more complicated requirements of spaceflights ahead, each chimp strapped in a restraint chair enclosed in an isola-

MARTIN NUCLEAR ROCKET PROGRAM

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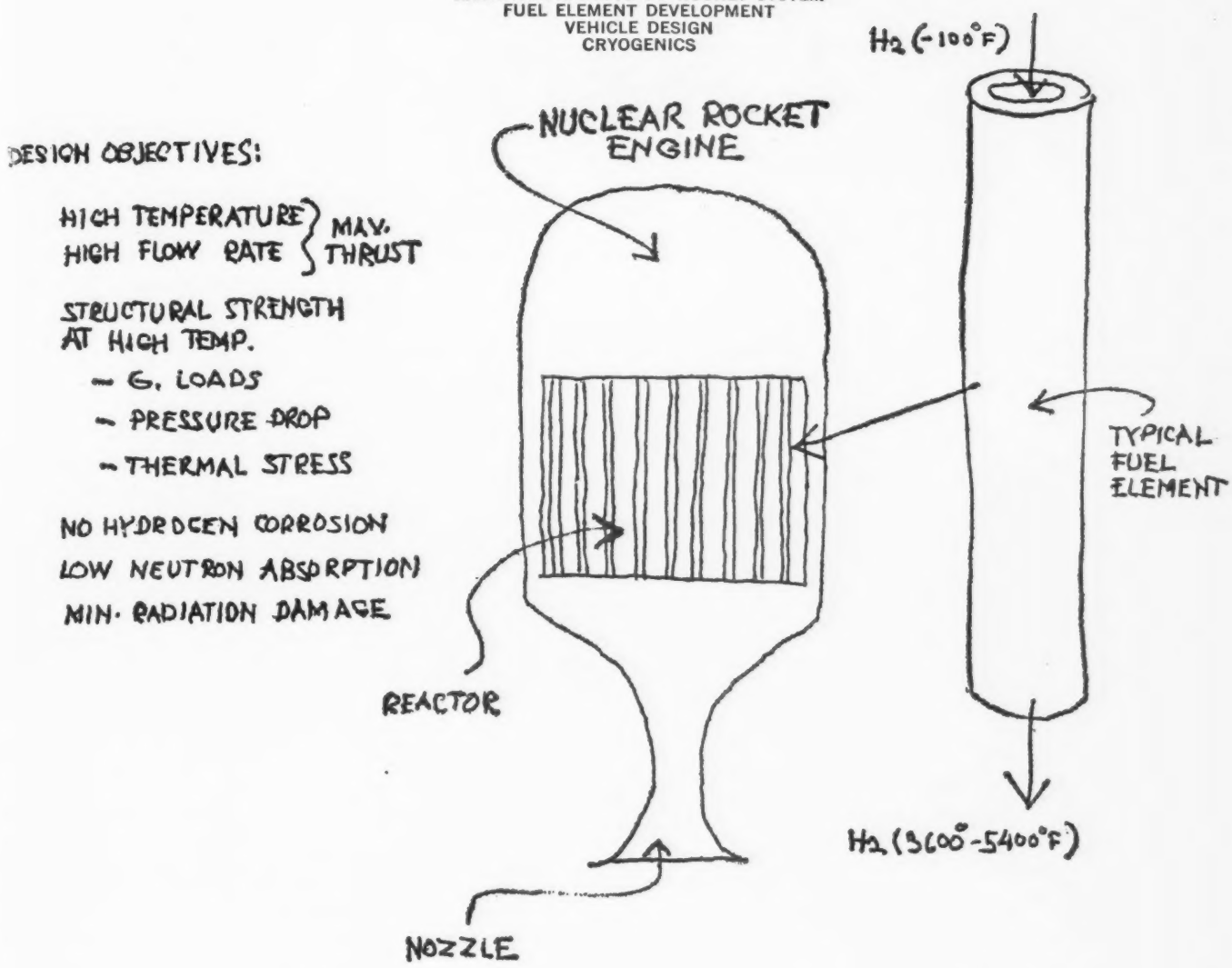
VEHICLE DESIGN
CRYOGENICS



THE PROBLEM OF FUEL ELEMENT DEVELOPMENT FOR NUCLEAR ROCKETS

Nuclear propulsion offers advantages for extended space exploration simply because nuclear energy provides more power per pound than any other power source known. Because fuel element temperatures for rocket reactors may range as high as 5400°F (higher than the boiling point of steel), the limitations of existing materials make the achievement of good fuel element characteristics extremely difficult. Drawing upon its existing materials research and development capabilities and background of producing fuel elements for a variety of reactors, The Martin Company has sponsored an independent program for a number of years directed toward the fabrication of suitable nuclear fuel elements for rocket reactors. This is part of a broad Martin program designed to help meet our national goals of testing the first nuclear flight system by 1966–67.

Test of a fuel element in a plazma jet chamber being conducted at Martin's Nuclear Division.

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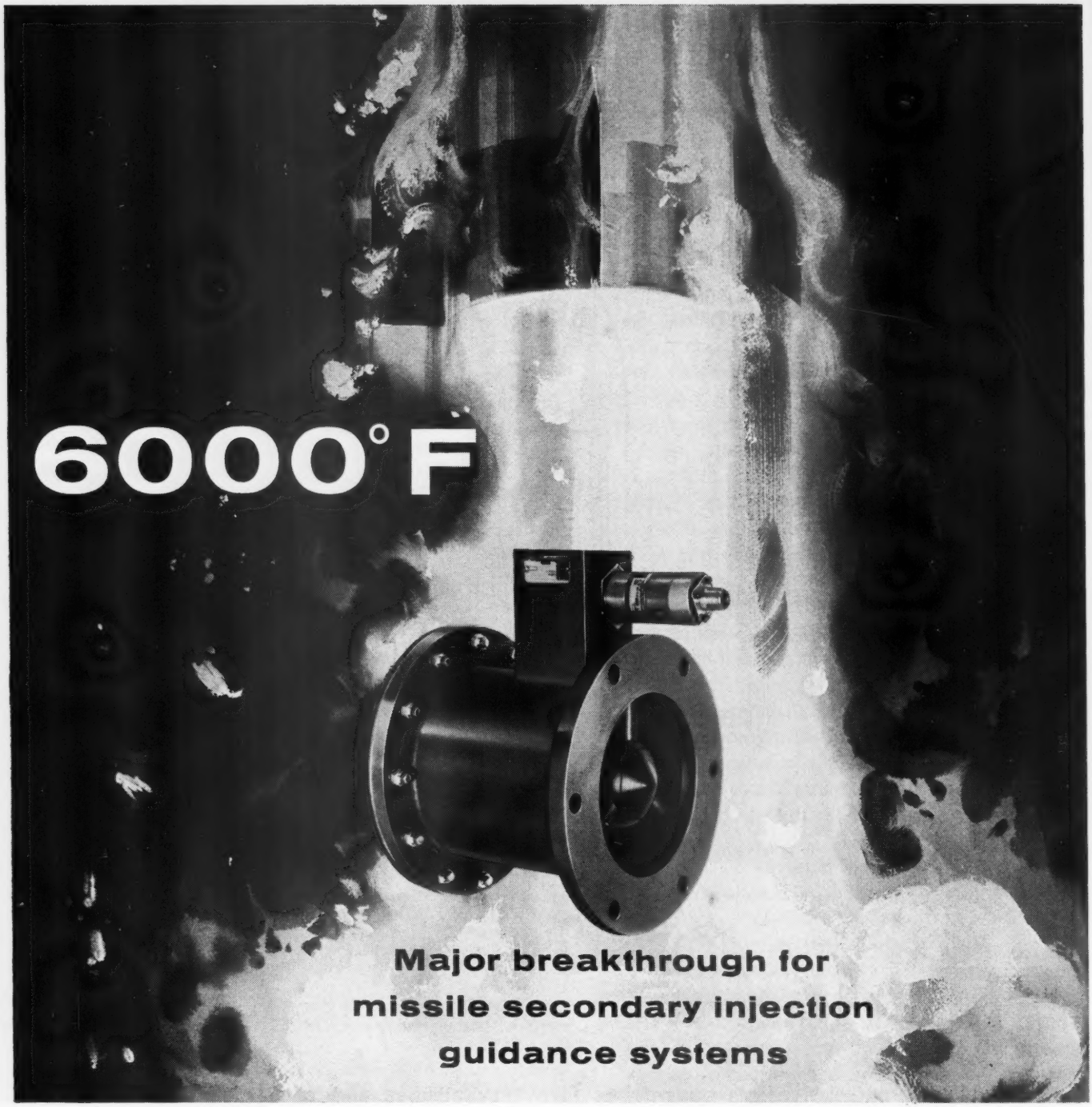

This AiResearch ultra-high temperature shutoff valve has been tested at 6000°F. Its development makes possible the use of secondary injection thrust vector control for greater simplicity and reliability.

This high temperature capability is an extension of previous AiResearch valve and controls experience in the −423 to 2000°F range, and further demonstrates over-all capability in the design of complete missile and ground support systems.

An inline poppet valve of extremely clean design has been produced to handle the high speed flow of hot, contaminated gas ducted from the combustion chamber to the exhaust nozzle. This design will: (1) keep lodging of contaminants to a minimum; (2) reduce turbulence and uneven wear; and (3) permit only a small pressure drop across the valve at maximum flow.

Growth into high temperature ranges can be accomplished by changes in material without changes in the basic valve design. The extreme compactness and light weight of the valve make it ideally suited for installation in the isentropic spike of a plug nozzle.

• *Please direct inquiries to Control Systems Project, Phoenix Division*

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tion chamber, linked to instrumentation that records his progress and performance. In their schooling, especially the early stages, the animals are spurred to efficient performance not so much by the possibility of a shock as by the promise of a reward, usually a banana-flavored pellet that pops out automatically after they make a certain number of right responses. Thirst motivation is also part of the training. Correct manipulations turn on a green light as a signal to the specimen that he can get a drink of water by slurping at a lip lever in his learning apparatus.

The star of the show in lever-pressing is a freckle-faced chimp named Cupcake, who at seventy pounds is over the weight limit for Project Mercury but who nevertheless is doing useful on-the-ground duty in behalf of space science. Stationed in a glass chamber, Cupcake performs at a panel with three levers, each paired to a small screen on which symbols are projected. Two of the symbols—triangles, say—are identical. The third is a dissimilar shape, maybe a circle or a square. Cupcake's job is to strike the lever identified with the odd symbol each time the set of three appears. After twenty correct presses, a food pellet drops into a cup for her.

In her best run so far, she has made 7,200 presses in forty-five minutes, erring only fifteen times. That's a rate of 160 presses a minute, or almost three a second. So consummate is her confidence that Cupcake rapidly flicks at the levers with her right hand while keeping her left hand poised on the cup to receive the pellets which are ejected every few seconds.

"The chimps thrive on these tasks and seem to work for the sheer enjoyment of it," says Capt. James E. Cook, a pathologist who is chief of the lab's veterinary services branch. "We all got a big laugh at one of the animals who was working the levers. A few minutes after he had finished and was released from his chair, we turned around and found he had climbed back in it and was operating the levers again—this time with his feet."

The men at Holloman Aeromed Lab are amused but never surprised by such antics, for they know the chimpanzee for a bright beast with a mischievous bent and a strong streak of whimsy which he brings into play on animals and humans alike.

The animals respond well to their relationship with the men at Holloman, sometimes developing such fondness for particular handlers that they perform below par when put to their tasks by someone else. Like children, they seek affection, recognition, and security, all of which they receive in abundant measure from attendants and technicians selected on the basis not only of occupational competence, but also of a genuine liking for animals.

"All the care and treatment they get is geared to making them as tractable and cooperative as possible, because that is how they are the most valuable to us," a member of the staff observed. "Our work with them is done in strict compliance with standards which the American Medical Association has set forth for the use of animals in research. If one shows undue stress or doesn't seem ready to apply himself properly to his task, he is excused from work for the day, either to play or to undergo medical observation."

They can be mulish at times. The other day Airman Robert Bush sought to demonstrate to a visitor how a tyke named Bobby Joe could flick levers to match flashing green and red lights in a two-dimensional tracking exercise. But Bobby Joe wasn't having one of his docile days. When Bush tried to seat him in the training chair, the animal stiffened, refused to go in, and started screeching. Bush didn't force him. He merely led him by the hand to a rest enclosure. This, too, Bobby Joe refused to enter. He pulled away with all his strength, yelling loudly. Again Bush brought him to the chair. Again there was resistance and wailing. Back they went to the enclosure. Bobby Joe stubbornly refused to get in. They repeated this routine several times, Bush trying to convince the chimpanzee to go into the rest box or the chair, Bobby Joe refusing to do either, and instead tugging his handler in a third direction.

"This is what is known as forced choice; he can go either into the box or the chair," Bush explained, panting with exertion, for even a baby chimp is a powerful creature with steely arm and leg muscles. "But this little devil doesn't want to do either. He's trying to lead me to the refrigerator, because he knows that's where the fruit is kept."

Finally Bobby Joe was placed in his box, where he quieted. When he was let out later, he bore no grudge against Bush for having imposed such a harsh decision against him.

The chimpanzee clan is one of the four anthropoid ape families, the others being the gorilla, the gibbon, and the orangutan. In their native jungles of equatorial Africa, the space chimps are captured by natives for sale to exporters, who then resell them to the Air Force, though not before veterinarians check them carefully on the scene. Captain Cook traveled to the French Cameroons

last year to personally examine a group of potential recruits, finally selecting fifteen to be brought to Holloman.

"We want young animals, between eighteen months and three years of age, and preferably males, because they develop and train better," Captain Cook says. "We try to get them in the best possible condition, but most of them are in pretty poor shape. The natives who capture them tie them up with bamboo strips and neglect them while waiting to sell them. When we get them they are full of cuts and parasites, and they are undernourished. If they were humans, they would be in a hospital."

Arriving at Holloman in the Tularosa Basin of southern New Mexico, where the desert stretches in vast flatness for mile on mile, the baby chimps are placed in isolation for at least forty-five days while they are treated for ills, brought to good health through diet and medicine, and oriented to their new surroundings.

At first they are pitiable little creatures, skinny, frightened, and withdrawn, but they soon begin to adapt and thrive in a regimen of prime care and tender handling. During the summer, college students matriculating in biology and allied fields are hired to work in the laboratory and, as part of their job, are assigned to mingle and play with the newcomers to foster their tractability and trust in the hands of the Holloman staff.

Only when the veterinarians find that an animal is physically ready is he moved to the first stages of training. He is conditioned to be at ease for gradually lengthened periods in the restraint of nylon-web vests and training chairs. He is taught symbolic and color values. He is tutored in simple tasks such as operating a lever to turn off a light. Rewards are always given to him as encouragement—a piece of fruit, a food pellet, or a lemon drop, which chimps love.

As a specimen advances in accomplishment, reacting satisfactorily in restraint and isolation, he is introduced to the simplest psychomotor devices. His first lever presses are largely accidental, for which he gets an immediate award that tends to impress on him that the act of operating a lever is good and desirable. He is then taught to strike the lever only in response to a symbol flashed on the panel.

Next, distractions in the form of other symbols appear in the pattern, and he finds that he will be awarded a tidbit only when he reacts to a specific symbol, regardless of how many others are projected before him.

These exercises lead to progressively more difficult tests in odd-set discrimination, like the one at which Cupcake excels. In this way chimpanzees only three, four, and five years old are brought along to increasingly complex tasks of the type they will be assigned in future space missions. They are also conditioned in enclosures that simulate the environmental factors of space, such as temperature, humidity, and pressure.

The chimpanzees' work day runs usually from two to six hours, varying with each specimen according to his behavior. For the rest of the day, when they are not being examined by the doctors, they are permitted to frolic in their cages or play in outdoor runs. At meal times they are fed a rounded assortment of chimp nutrients, the fare consisting of fruit, special food pellets, condensed whole milk, fresh eggs, and pablum, supplemented by bottled vitamins and minerals.

"They are just like children, and they take the standard pediatric treatment for human youngsters, including the same medicines," Captain Cook said. "They come down with the regular childhood diseases, such as whooping cough, measles, and chickenpox, and the chimp is the only animal that gets the common human cold."

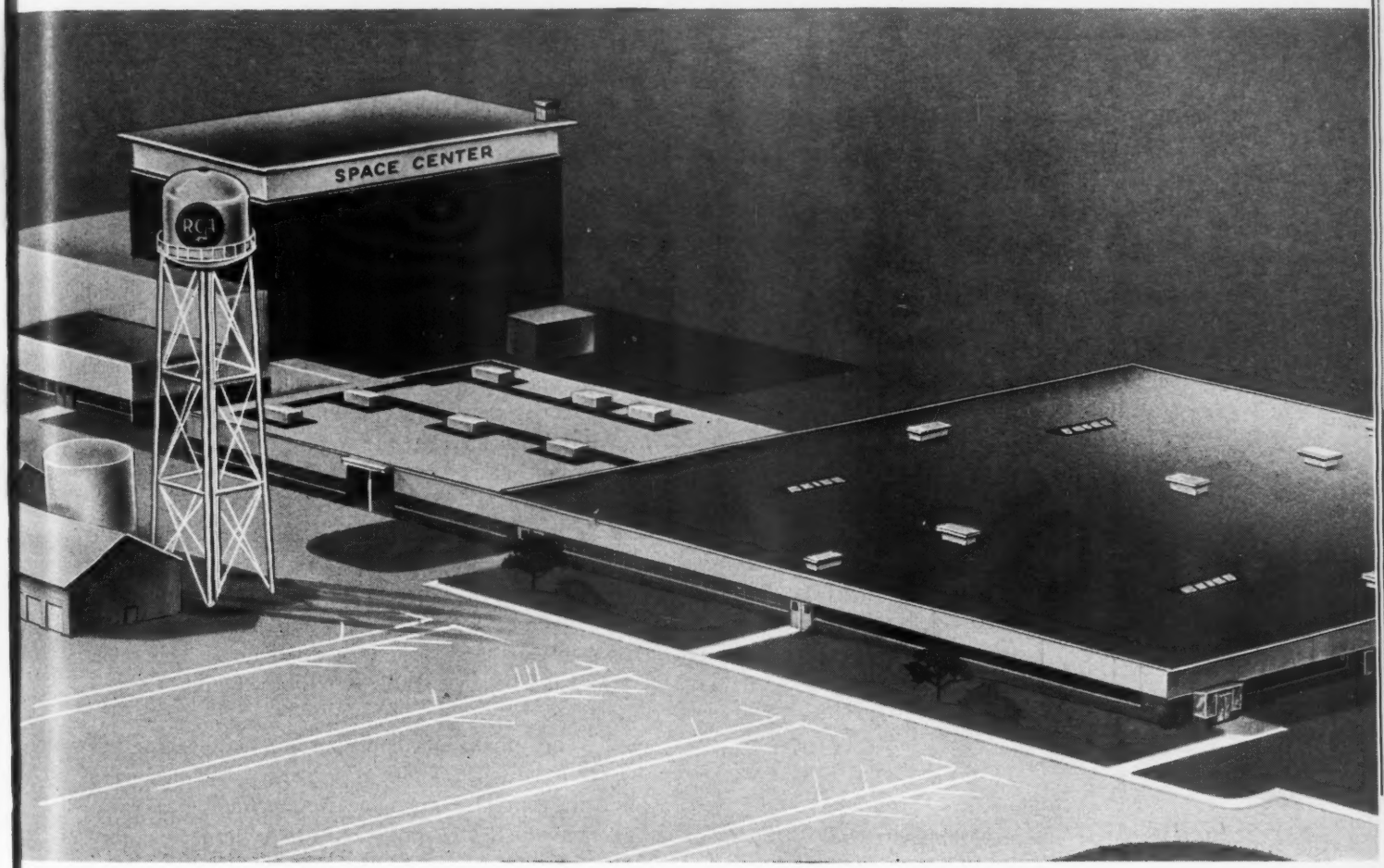
In preadolescence, the space chimpanzees are endearing, if unpretty creatures, with their wizened, old-man faces, abundant hair, large ears protruding from their heads like jug handles, little pot bellies, and flattened noses that resemble the hammered proboscises of well weathered prize fighters.

They grimace and gesture spiritedly and they make a lot of noise. The happier they are, the noisier they become, advertising their well-being by yammering, screeching, and bouncing up and down in their cages and thumping the sides. Strong as they are, with sharp teeth, they rarely if ever turn on their handlers, seemingly seeking more to win a man's friendship than to hurt him.

And the men who tend and train the chimps at Holloman do consider them friends. Indeed, they regard them as friends of all mankind.—END

The above article, which originally appeared in the Bee-Hive, *quarterly publication of the United Aircraft Corporation published at East Hartford, Conn., appears here in slightly condensed form through the courtesy of the* Bee-Hive *and United Aircraft Corporation.*

New RCA Space Environment Facility Brings Outer Space Down to Earth...



... Will pretest coming generations of U.S. space vehicles and satellites at environmental extremes assuring reliable long life operation and optimum performance.

Included in the new environmental equipment and facilities being built and installed at the RCA Astro-Electronics Division at Princeton, N.J., are the following advanced testing devices:

Vacuum-Thermal Chamber — measuring 28 feet in diameter and 25 feet high to accommodate the coming generations of space vehicles and satellites and meet all vacuum-thermal requirements.

Vibration System — provides 28,000 pounds peak force for sinusoidal, and 28,000-pound rms force for random motion testing.

Temperature-Humidity Chamber — so versatile it can create virtually any thermal-humidity condition desired. Temperatures may be varied from —85° F to 250° F; humidity from nil to maximum.

Rotary Accelerator — subjects subsystems of space vehicles and satellites to forces as high as 2500 g lbs.

The entire RCA Space Center, which contributed to the success of projects such as SCORE, TIROS I, TIROS II and ECHO I, continues to be dedicated to the conception, development and production of earth satellites, space vehicles and ground support and information handling equipment. For additional information about RCA's engineering talents and proved capabilities, contact the Manager, Marketing, RCA Space Center, Box 800, Princeton, N. J. And, for a complete description of the new environmental facilities, write for your copy of the brochure "RCA Space Environment Center."

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Speaking of SPACE

WILLIAM LEAVITT
Associate Editor, SPACE DIGEST

Are We Spreading Ourselves Too Thin?

There is a theory current in Washington that to create public acceptance of the manned lunar landing program, the top leadership of the National Aeronautics and Space Administration hopes to create in every corner of the land a viable stake in the effort. The more communities excited by new construction, the more universities under contract, the more industry involved in the program, according to such reasoning, the more tied the nation as a whole will be to the program.

If this is the present philosophy of NASA, it has a good deal of superficial validity. Everyone recalls that defense plants during World War II brought home, as did the personal involvement of sons away at war, the impact of the conflict.

But World War II and putting men on the moon are not exactly the same thing. Nor are the training of mass infantry for battle and the creation of a corps of astronauts to man aerospace vehicles in the performance of potentially significant scientific and military missions of quite the same order. This is a new technological day, and one of its nettlesome features is the fact that we cannot again be as prodigal with our resources as once we were —particularly skilled brain power.

A case in point: In late June, the Senate space committee, responsive to the President's call for a national commitment to the lunar objective, quickly reported out the new fiscal 1962 NASA authorization requests designed to implement the President's program. The Senate passed the authorizations rapidly a few days later. At this writing, the authorizations were on their way to a House-Senate conference, although there were some indications that the House, which had earlier passed on the more conservative requests for money of last March, might take a second look at the newer, larger requests.

Generally, all to the good. After the relaxed attitudes toward astronautics during the last Administration, such willingness to support sizable programs was refreshing.

But in that authorization were two items of vital significance to the manned spaceflight goal. The first was a labeled request for more than $20 million for NASA expenditures in life science research and development. Where was this money to go? To explain where at least some of it will go, we quote from page 28 of the NASA authorization, under the heading, "Aerospace Medicine" one of the three life science headings. The other two are "Space Biology" and "Flight Experiments."

"This phase of the program includes the research and development aspects associated with engineering and bioengineering technological principles which are applicable to the biological, behavioral, and biomedical sciences. Work will be conducted on the requirements of integrating the human operator into space systems; the provision of engineered environment to maintain life and performance in space; the use of adequate methods to furnish information to the human operator for the control of the spacecraft; the protection of man and machine against the effects of the various types of space radiations; the biological implications associated with communication processes; remote control; the measuring and recording of physiological and psychological parameters during space operations; and the methods and means for spacecrew selection and training."

The second significant NASA request, explained on pages 101-104 of the bill in a passage entitled "General," was for some $60 million for a manned spaceflight laboratory complex to be built at an as-yet-undesignated site in support of the moon project. Again we quote from the NASA authorizations:

"Four integrated facilities with their supporting

utility installations are proposed for construction at a site to be determined. The facilities, which are described in greater detail on the following pages, include a flight project facility, an equipment evaluation laboratory and support facility, a flight operations facility, and an environmental testing facility. . . ."

Two items are of particular significance here, first the proposed Flight Operations Facility, described thus, in part:

"The proposed facility will permit the evaluation of the performance and operating characteristics of standard and custom hardware systems and components for executions of specific navigation and control functions, and the specifications of necessary modifications to meet operational requirements. This facility is also required for demonstration of the effectiveness of the man-machine system in a representative navigational environment and for development of practical operational procedures for specific flight missions.

"In the training area, instrumentation and training devices are required for training programs associated with specific missions. The training requirements include the training of flight crews, flight controllers, and ground crews."

And second, the proposed Environmental Testing Laboratory, described this way, in part:

"Environmental test equipment to be included . . . will include two large thermal vacuum chambers in which the Apollo-class spacecraft modules and assemblages may be subjected to the pressures and thermal environments of spaceflight. . . ."

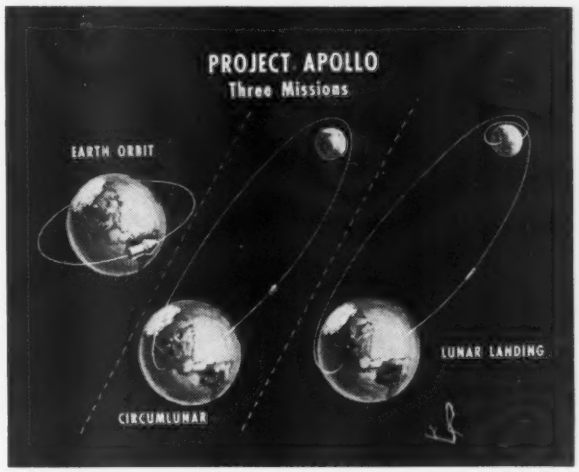
The description then proceeds to say that "the facilities now available or under construction are inadequate to meet the needs of Apollo-class spacecraft."

Understandably, there was strong interest on Capitol Hill in getting the proposed new center located in this or that district.

If you add the $20 million-plus to the $30 million cost of the two items described above, you get a sum of more than $50 million, a total which can be identified as NASA's proposed bioastronautical-bioengineering investment for fiscal 1962, although the figure is of course even larger, if you count the support expenditures. Looked at superficially, such a sizable piece of money should delight the many sincere proponents of manned spaceflight. Pump more money into the project and you get faster solutions to the tricky problems associated with long-term purposeful spaceflight.

This argument would be quite valid if the country were just now starting from scratch in bioastronautics. But that is not the case. The country is by no means starting from scratch. We *do* have a considerable capability in the field, and to legislate a new capability as if we *were* just starting from scratch is to do havoc to the existing capability.

Yet that seems to be what we are about to do. It is a potentially mortal blow to the national hopes for successful astronautical operations, especially in terms of our all-but-admitted race with the Soviet Union. In fields where once we excelled the Soviet Union, aerospace medical capability and bioengineering, we are about to tear down and rebuild a complex structure, instead of building on the existing base. Even as we rush the development of the boosters needed to put our men in space, we will be going through the tedious and ironic business of moving the relatively small number of man-in-space experts in the country from their present billets at military installations across the country to new installations and centers of activity, which will take much money and time to build. For even dedicated team members have mortgages and must go where the supergrades go.



—NASA photo

This is a National Aeronautics and Space Administration artist's conception of the three basic phases of Project Apollo development: first, earth-orbital flights for crew training, equipment checkout; next, circumlunar flight; finally, manned landings on the moon, hoped for before the end of present decade.

Two or three years from now, as we listen to the pratings of Soviet crews orbiting the planet in air-conditioned ease, our only comfort may be the glamor of dedications at sparkling new centers of this and that, while the weeds cover the places where the know-how formerly bloomed.

It is an unhappy prospect, and it is hard to

understand why it has to happen. Although they are by no means legion—and that is the crucial point—it is true that there are hundreds of highly qualified people in the Department of Defense who can do the job of ensuring life support for important scientific and military space missions. This is proved by the fact, as Rep. Emilio Q. Daddario, Democrat of Connecticut, has pointed out repeatedly, that many of them are already on loan to NASA for the Mercury program.

Representative Daddario, who has fought nearly a lone battle in Congress for the use of and strengthening of existing biomedical and bioengineering installations to meet both NASA and military bioastronautic needs, put it this way in commenting on the passage of the NASA authorizations:

—US Air Force photo

Last month saw conclusion of experiment at USAF's Aerospace Medical Center, Brooks AFB, Tex., in which Capts. Bernard Westfall, Louis Gang, spent seventeen days in a 100 percent oxygen atmosphere without ill effect. Right, Dr. Hans G. Clamann.

"While I thoroughly agree with the urgency and need [for the lunar program], I believe that the best way to do it is by building on the base of existing work and facilities where they are available. I am referring specifically to the knowledge in aerospace medicine and the capabilities for further research in that area within the Department of Defense."

He charged that some NASA officials apparently regarded their new priorities as a "blank check" to request funds for research and development, including the new $60 million manned space laboratory.

"I have been concerned for some time," the Congressman said, "with the desire of NASA to expand a separate program in the life-sciences area, despite the fact that the US already has an investment of millions in such work and the fact that there is a critical shortage of skilled and competent professionals."

He went on to note that almost all of the biomedical research for Project Mercury rested on knowledge developed at such installations as Brooks, Holloman, and Edwards Air Force Bases, where civilian/military teams have for years been working on data needed to meet future requirements of high-performance flight.

He took note of potential military space missions, saying: "The Department of Defense has a continuing responsibility to study the environments in which man's future military missions may require him to operate, and this does not exclude man in space.

"Two years ago," Congressman Daddario declared, "NASA asserted that it had to build a capability of its own. It borrowed military scientists on temporary duty, added some others, and started with less than twenty-one people and $5 million.

"This year it requested [in March] fifty-one people and $8 million. The House space committee . . . demanded a detailed explanation. As a result, some construction was dropped, the research program was reshaped and clarified, and existing facilities were utilized more fully in planning.

". . . Nevertheless, under the cloak of the man-on-the-moon program, NASA is now asking for and on its way to getting approval of 151 people for life-science research—an increase of 100 since March—and a budget of $20.6 million, in addition to the new request for a $60 million spaceflight laboratory."

The Congressman continued: "Recognizing that we number our top people in biomedicine in the space field in the hundreds, any authority to build up this new program as NASA wants is an invitation to raid other agencies or underwrite piracy in the faculties and laboratories. It presents a clear danger that we will fritter away our resources and possibly cripple an existing effort of importance to our security."

It is not obstructionism to argue with the sort of thinking that has created the portentous situation Mr. Daddario describes. It is common sense.

No one would argue that the military has all the answers or has a perfect record. On the space medical side, the expected unification within the

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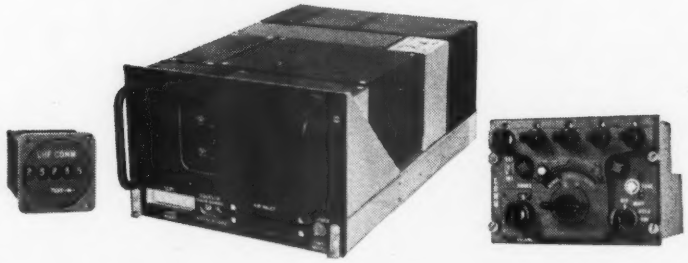

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THE MAGNAVOX CO. • DEPT. 404 • *Government and Industrial Division* • FORT WAYNE, IND.

Air Force of aerospace medical research under the Systems Command is long overdue, and the military space pilot pool studies which you've seen fictionized in Milt Caniff's "Steve Canyon" strip and which are more than fiction should have gotten under way earlier (although the political "space-for-peace" pressure under the Eisenhower Administration made that nearly impossible).

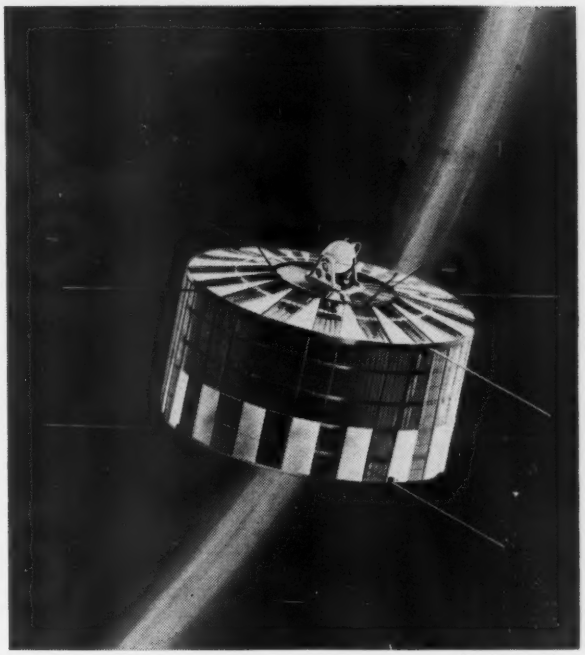
But it remains true that within the military does lie the capability to meet manned spaceflight requirements. It is folly to shatter and diffuse that capability.

The working-level people in NASA and the military want to get on with the manned-spaceflight job, be it civil astronauts to the moon or military Dyna-Soar pilots. It is up to the planners to produce the statesmanship needed to get the job done.

Space Capsules

The Sunday-supplement approach to science, so annoying on our side of the Iron Curtain, has its practitioners in the Soviet Union too. DOCENT F. ZIGEL, in a popularized article on Mars published in Moscow's *Zhaniye-Sila,* proceeds from assumptions by Soviet and western astronomers that earth is not the only inhabited planet and from the work of the late, respected Soviet astrobotanist Tikhov and western scientists which suggests the existence of vegetation on Mars to a strongly worded case for past or present existence of rational beings on our neighbor planet. The famed Martian "canals," Zigel writes, are clearly the work of rational beings. The canals were built in a recent geologic period, he says, and it is quite possible that there are major cities at the junctions of the canals.

Also, suggests Zigel, Mars' satellites are artificial and were probably built between 1862 and 1877. The canals, he believes, are probably for irrigation and still in operation, which would indicate that the Martians are still struggling with their harsh environment. Obviously in line with Soviet political philosophy, Zigel suggests that there are no national boundaries on Mars; severe conditions have forced planetary unity and cooperation. Cosmic communism? Must we contemplate the spread of the Gospel according to St. Marx to the sands of Mars? Imagine a Soviet Socialist Martian Republic. . . . The problem of sterilization of space vehicles to avoid contamination of other celestial bodies and to bar arrival of potentially dangerous organisms from space is pointed up by reports



—Martin Co. photo

First nuclear-powered satellite, Navy Transit IV-A, launched June 29, shown in sketch, signaled to earth with energy supplied by Martin-built SNAP atomic generator. Plutonium-decay-produced heat is converted directly to energy by thermoelectric system.

from the NATIONAL RESEARCH CORPORATION, Cambridge, Mass. Three hardy types of bacteria common to soil and human hands withstood the effects of ultrahigh vacuum—equivalent to a few ten-billionths of atmospheric pressure—for a period of five days. NRC's vacuum chamber, according to its report, can simulate vacuums at 600-mile altitudes. . . . An interesting analysis of the economic potential of communication satellites by the RAND CORPORATION'S WILLIAM MECKLING is in the June 16 issue of *Science,* the publication of the AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

Write to the AEROSPACE MEDICAL ASSOCIATION, Washington National Airport, Washington, D.C., for information on availability of the Association's newly published survey of bioastronautical activities. It is a handy compendium on current space medical studies at military and civilian installations in this country.

Investing in Scientific Progress, the NATIONAL SCIENCE FOUNDATION'S ten-year forecast of US science needs is now available. Some of the principal conclusions: The US must fully develop potential scientific talent to ensure the national future well-being. An increasing number of young people show interest in scientific careers. With such a trend we could have twice as many scientists in

1970 as we have now. To maintain such a trend will demand heavily increased dollar investment in science education and basic research in colleges and universities, something like $8.2 billion in fiscal year 1970 as compared with $3 billion in fiscal year 1961. Quality of science education must be paramount, the report stresses, since in the face of general population increases, even postulating a 20,000,000 increase in US population, this country cannot hope to compete in sheer numbers of scientists and managers.

Another vital point is made in the report: that an increase in scientific personnel will not handicap the other professions. "Of all 'doctoral-age' young people who score in the top one percent on intelligence tests," the report says, "fewer than one in twenty now get doctorates in science and engineering." A proposed doubling of science and engineering doctorates would still leave plenty of talent for other professions. . . .Write to NATIONAL SCIENCE FOUNDATION, 1951 Constitution Avenue, Washington 25, D. C., for information on availability of the report.

We're pleased to note that BELL TELEPHONE LABORATORIES TECHNICAL INFORMATION LIBRARY has included *Space Weapons,* compiled and edited by the editors of AIR FORCE/SPACE DIGEST, on its spaceflight reading list. . . . PRINCETON UNIVERSITY and the GUGGENHEIM FOUNDATION have established a new center at Princeton, the DANIEL AND FLORENCE GUGGENHEIM LABORATORIES FOR THE AEROSPACE PROPULSION SCIENCES. The new center will offer four or more fellowships annually in aerospace propulsion sciences to qualified scientists and engineers for graduate work in the field. The fellowships will carry stipends of up to $2,000 a year plus tuition. For information, write to the Daniel and Florence Guggenheim Foundation, 120 Broadway, New York 5, N. Y. . . . The space age is coming to the AMERICAN MUSEUM OF NATURAL HISTORY in New York, and aiding in the effort is the MARTIN COMPANY. Martin has presented a full-scale model of Aries (authentic reproduction of an independent earth satellite), based on Martin studies of a five-man orbiting scientific laboratory at 350-mile altitude. The Aries display will go on exhibit in the Museum's Roosevelt Hall on Columbus Day.

And speaking of education, DR. GLENN SEABORG, Chairman of the ATOMIC ENERGY COMMISSION, in a commencement address at OHIO STATE UNIVERSITY, had these worthwhile and cogent things to say: ". . . If we need to decide more complex matters more quickly, and incidentally, operate an increasingly complicated industrial and technological apparatus, we must have more adequate preparation of our citizens." Dr. Seaborg went on: "The rate of improvement of the educational level of the whole population must be accelerated, led by the universities. We must search out and stimulate the fullest development of gifted young people in all creative fields. We must impart the conviction that education is a lifelong job and seek a balanced educational content that will equip our citizens for the world of change. We must extend our efforts to rescue lost talent among women and many minority groups. Our labor force must be better trained and be capable of moving up to higher and more rewarding and necessary skills. As we measure our educational curricula against our heritage of knowledge, we must be constantly alert for imbalances. The onrush of science to such a critical position in our affairs caught our educational system unaware. I feel that there is no challenge more urgent than the provision of scientific literacy for the liberal arts graduate."

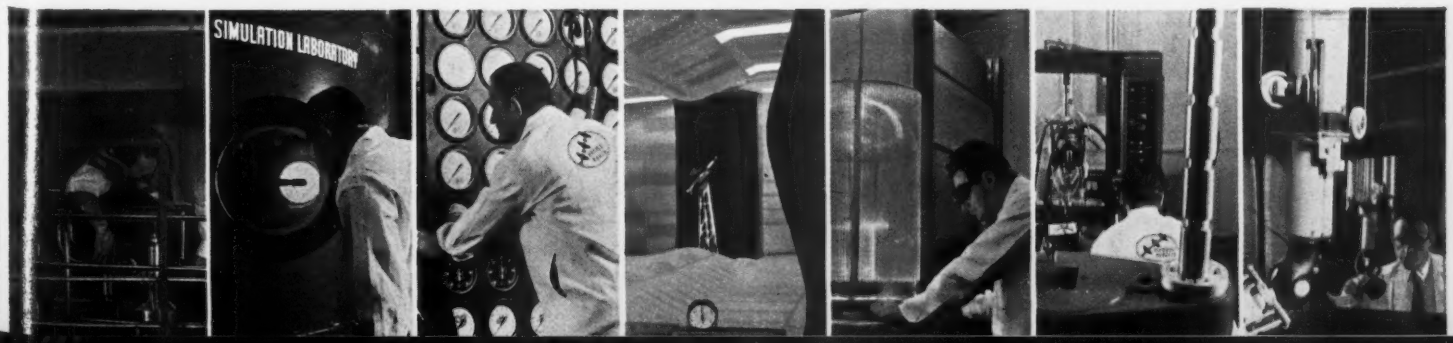
Theme of the US government-backed CENTURY 21 EXPOSITION, scheduled for April through October 1962, at Seattle will be "man in the space age." Billed as a forecast of how man will live in the year 2000, Century 21's biggest feature will be the world-of-science exhibit. A Spacearium, in which a Boeing-sponsored Cinerama film projection technique will be used, will take viewers on a trip through the universe spanning some two billion light-years.—END

The Uses of Space

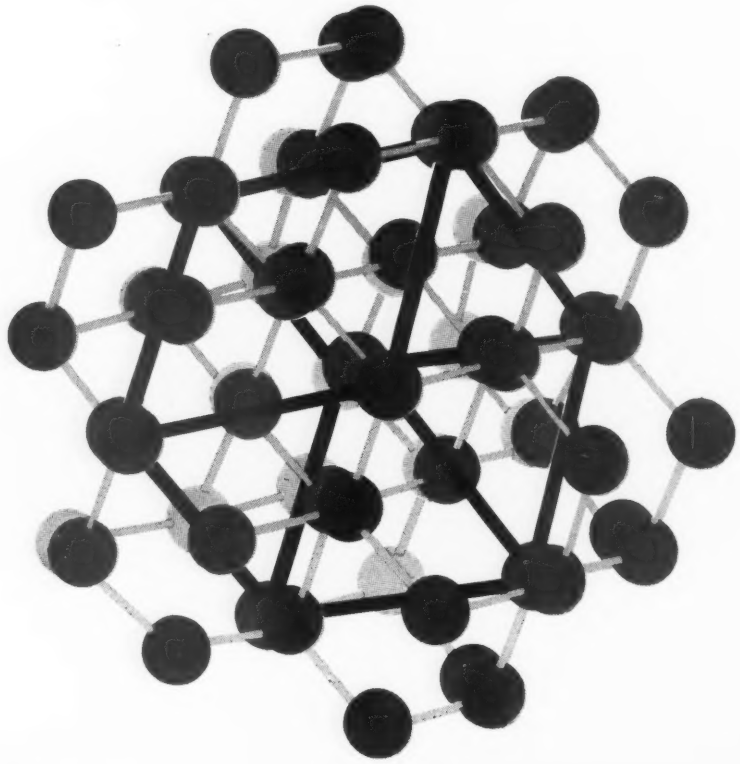
Man is the searcher. He has a driving urge to know. After centuries of speculation, we now know that the world of space is infinitely more vast even than in our dreams. How shall we rise to the challenge of space knowledge? Ask any scientist and he will tell you: space is not something to be conquered but to be used--for reconnaissance, instant world-wide TV and radio communications, weather forecasting and basic research. Where will it all end? It never will.

Shown above is one feature of Republic's Space Environment and Life Sciences Laboratory, largest space chamber in the nation capable of testing men and space systems at simulated altitudes of more than 150 miles. Republic's new Research & Development Center is the only fully integrated industrial research complex engaged in every vital area of space investigation. Eight laboratories comprise the Center: Space Environment and Life Sciences; Re-Entry Simulation; Materials Development; Nuclear Radiation; Electronics; Guidance and Control Systems; Fluid Systems; Transonic, Supersonic and Hypersonic Wind Tunnels. Behind Republic's record of military aircraft success is the idea of man as the "irreplaceable element." This same concept is the basis of Republic's wide-ranging exploration of every field of space knowledge.

REPUBLIC
AVIATION CORPORATION
FARMINGDALE, LONG ISLAND, N. Y.



How Science Serves Defense at Westinghouse . . . Molecular Electronics



MOLECULAR ELECTRONICS PROGRESS AT WESTINGHOUSE: COMPLEX SYSTEMS MADE WITH MULTI-FUNCTION "BLOCKS"

Multiple electronic circuit functions in microscopic solids—and successful combinations of these tiny structures into systems—have actually been accomplished in the Westinghouse molecular electronics program.

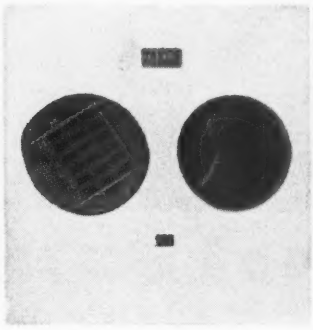
Examples include an operating UHF communications receiver, a 3-bit binary computer unit, and a digital guidance receptor. Although still in early development, these examples are working demonstrations of molecular electronic systems. They indicate exciting things to come in this revolutionary new field.

Primary goal of space-saving molecular electronics is systems reliability . . . functional electronic blocks have fewer components and connections . . . less power is needed, less heat generated . . . redundancy is simple to achieve.

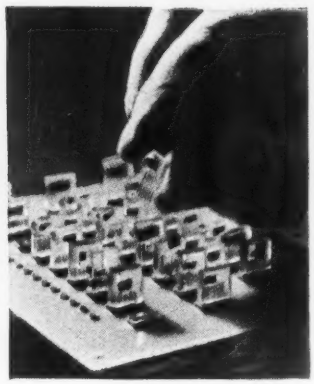
Working under an Air Force contract, Westinghouse scientists have invented tiny molecular blocks to do many sophisticated electronic jobs. They have made new semiconductor materials, grown crystals in ribbons and layers, and developed the industry's most advanced techniques for fabricating circuits in molecular blocks.

Pioneering in this important field is another of the many ways science serves defense at Westinghouse. Defense Products Group, 1000 Connecticut Ave., N.W., Washington 6, D. C.

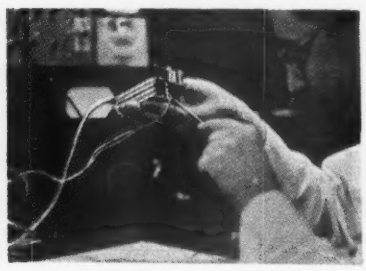
Westinghouse



Three of many functional blocks: top center, a transistor "and" gate replaces 6 conventional components. Lower center, a 10 MC video amplifier for telemetering. Planar device at left contains 20 resistors, 8 transistors, 40 diodes—all diffused.



Here is a laboratory model of a three-bit binary computer circuit with 26 encapsulated molecular gates working together as a unit. Tiny "and" gate (held) contains 4 diodes, 1 resistor and 1 transistor.



Hybrid molecular electronic UHF receiver, being developed for the Air Force, was designed with specifications of the AN/ARC-63 as a guide. Circuits operating below 30 MC are constructed with molecular electronic blocks.

Westinghouse work in molecular electronics for the Air Force is under the jurisdiction of the Aeronautical Systems Division's Electronic Technology Laboratory.

—US Air Force photo

USAF and the Royal Air Force have flown as brothers in arms through two decades of war, peace, cold war, and near war. 'Generations' of American airmen, from wartime B-17 and P-38 pilots to the technically oriented B-47 and Century-series fighter jockeys of today, have served in the United Kingdom during . . .

Maj. Robert Spence, USAF

WE CAME here twenty years ago as allies in war. Today we are here as partners for peace."

Saying this to a British audience recently, Air Force Maj. Gen. John H. Ives was pointing to one of the most remarkable military partnerships of our time—between the US Air Force and Britain's Royal Air Force. In the past twenty years, this partnership has helped bring victory in war and peace in the cold war that followed.

When the first Yank pilots came to Britain in late 1941, the Air Force was still in its Victorian era. Today, US pilots are still flying from British bases as part of an Air Force that's pushing the Buck Rogers era. Almost a generation separates the "hot-war" B-17 and P-38 pilots with their "fifty-mission-crush" hats from the technical-minded pilots of the B-47s, F-100s, and F-101s flying today's cold-war missions from British bases under the over-all command of General Ives as boss of the Third Air Force and USAF's top man in Britain.

Many pilot veterans of missions against Regensburg, Ploesti, Schweinfurt and Normandy complete twenty years of service this year; they are making retirement

(Continued on following page)

plans. Kids who were in the first grade when P-47s were strafing enemy tanks beyond the Normandy beachhead are today flying supersonic jets on NATO practice exercises.

Yet all of them have one thing in common. They're part of an RAF-USAF association that marks its twentieth anniversary this year.

Such major anniversaries are often dull affairs—excuses for dragging out old clichés, for making routine nostalgic speeches. But it's difficult to avoid growing nostalgic over this one. Practically every airplane in the Air Force inventory since 1941 has flown out of Britain on front-line missions in peace and war. A *Who's Who in the Air Force* would contain the names of few men who haven't done tours in Britain.

Today, in the London suburb of Bushy Park where USAF makes its headquarters, American high-school students wrestle with arithmetic and geography problems in the same Eighth Air Force and SHAEF buildings where men like Eisenhower and Spaatz planned the bombing offensive against Germany, the D-Day landings in Normandy. The huge depot at Burtonwood in Lancashire—where more than 25,000 GIs serviced the bombers and fighters of World War II, where a few years later mechanics worked day and night overhauling the scarce C-54s flying supplies into Berlin—is today practically deserted. Its large hangars, shops, and warehouses are empty; its runway is gradually settling because of coal mining beneath. Places like Thurleigh, Hethel, Steeple Morden, Horsham St. Faith, Christchurch, Chipping Ongar, once home to pilots returning from ack-ack and Messerschmitt-filled skies of Germany, are unknown to today's US airmen in Britain. Some of the old bases are still around—Alconbury, Sculthorpe, Prestwick, Molesworth, Greenham Common—but it's not quite the same. It could never be the same.

From 1941 to 1961, with time out for a dangerous two-year "break" after the war, the USAF has been a familiar part of the British scene. In these twenty years, airpower has undergone fantastic changes. The hot-shot World War II bomber pilots and maintenance experts who got out when the war ended would be almost complete strangers to the USAF setup in Britain today. The jet engine, the H-bomb, the transistor, and the rocket engine have changed weapons, tactics, delivery systems.

And the change is more than technological. Today's Air Force in Britain operates under different ground rules in a vastly changed political and social context. USAF, a permanent part of the scene, has "settled down." Some 3,000 airmen, for example, every year march to the altar with British girls. After a hard day at the base, today's Air Force officer and airman drive home to the wife and kids who live in the British village near the base. The early dawn and night missions are still flown, and they're pretty rugged, but the practice bombs drop harmlessly on target ranges.

—US Air Force photo

Maj. Gen. John H. Ives, above, is the current Commander of the US Third Air Force, USAF's top man in Britain.

It's a get-ready and stand-by job—and the big mission is to keep strong enough, ready enough, to avoid ever having to fly a mission of violence.

The old-timer who got out might wonder what's taken place in Britain since he left after the war. In telling that story, you'd have to begin with January 1946—a time when most people had one thing on their minds—demobilization. Most people but not all. Two exceptions were Gen. Carl Spaatz and British Air Marshal Sir Arthur Tedder, who were making a farewell trip to AAF bases in Britain about that time. They were worried about the way the West was closing up shop. For one thing, the two men wondered what would happen if the US found it necessary to deploy its B-29s overseas. Not a single British airfield was ready for them. To correct this, they decided informally that the RAF would prepare four East Anglia bases to receive B-29s

—US Air Force photo

RAF, USAF flyers with US F-100D and British Hunter jets at British field.

—US Air Force photo

High US, British officers including US 7th Air Division Commander Maj. Gen. W. H. Blanchard, right, RAF Air Vice Marshal Cross, left, and an RAF Thor IRBM.

–just in case. This decision turned out to be a wise one.

Two and a half years later, the Soviets, having taken over the free government of Czechoslovakia, clamped a blockade on the city of Berlin. The story of the airlift of 2,343,315 tons of food and coal into the city by RAF, USAF, and Navy planes has been well told. Not so well known is a behind-the-scenes power move by the US and Britain's Labor Government which, in that time of great danger, sent two squadrons of B-29s to these prepared sites. These bombers were the West's answer to the powerful strength of the Red Army. They were a warning to the Soviets against pushing too far. And they were the beginning of a revived USAF buildup in the UK which has continued to this day with the same mission of deterring Soviet aggression.

These first bombers were based at Scampton, Marham, Waddington, and Lakenheath, names familiar to World War II airmen. They were placed under control of the newly formed 3d Air Division, commanded by Maj. Gen. Leon W. Johnson, who was directly responsible to the Air Force Chief of Staff. Later a supply and maintenance depot was formed at Burtonwood to support the SAC bombers and to maintain the C-54s that were flying supplies into Berlin.

This was an emergency move expected to last about sixty days. Said one USAF noncom at the time, "We got yanked out of airfields all over the States to come on this job. Most of us only got twenty-four-hour notice—not nearly enough to straighten out our personal affairs."

"But," he continued, "I figure it's only for sixty days temporary duty, and it's not too bad." Those sixty days were twelve years ago. The temporary duty is still in effect. The 1948 move was only the beginning. As evidence of Soviet truculence mounted, plans were made to build four new USAF bomber bases with the US and Britain sharing costs. These were to be available to the USAF so long as the presence of USAF units in the country was "considered desirable in the interests of common defense." After the Korean War broke out in June of 1950, the USAF buildup was expanded to include twenty-three other airfields and three depots.

—Denham Studios, England

US airmen are now long-standing part of British scene, take part in British life at a number of levels. Here several meet Queen Mother at outdoor party.

To control this massive base complex, the 3d Air Division was made the Third Air Force on May 1, 1951. Its job was primarily to handle the base development program and operations of tactical aircraft. On March 21, 1951, the 7th Air Division, a major Strategic Air Command subcommand, was organized to handle the operations of SAC bombers from United Kingdom bases. Both these units celebrate their tenth anniversary in Britain this year.

From 1948 to 1961, now the length of three World War IIs, USAF aircraft have been flying out of Britain. Governments have changed on both sides of the Atlantic, technology has been revolutionized, international crises have come and gone—Korea, Indochina, Suez, Hungary, Formosa Straits, Laos, Congo. In the early years before NATO got on its feet, before the intercontinental ballistic missile and the intercontinental bomber, these USAF planes flying from Britain played a major role in keeping the peace.

It hasn't been an easy job. And it hasn't come cheap. Several hundred lives have been lost in operations and training, including the RB-47 crewmen shot down by the Soviets in the Arctic Sea. Several billion dollars have been spent in building the UK bases and in manning and operating them. Assets of the Third Air Force alone today are more than a billion dollars. The men who man the aircraft don't fly out on missions of violence, but they keep a rough schedule. Both SAC and USAFE units maintain a ready-alert system, and both run regular missions testing their war capability. In carrying out their mission, they work very closely with the Royal Air Force.

A lot of Air Force history has been made in the UK since the Air Force returned in 1948, the year of the Berlin Airlift. Several pioneering jet flights across the Atlantic

(Continued on following page)

Each year some 3,000 US airmen marry British girls as in wedding below.

—US Air Force photo

—Photo courtesy British Air Ministry

In Memoriam: Our Honored Dead

Night after night in the early days of 1941, German bombers turned London into a blazing inferno. On the night of May 10, in one of the worst raids, incendiaries destroyed the lovely old Anglican Church of St. Clement Danes in the heart of the British capital. The famed bells—about which centuries of British children had singsonged, "Oranges and lemons say the bells of St. Clement's"—were stilled.

For the next fourteen years, the burned-out ruins of St. Clement's stood as the Luftwaffe had left them. They constituted a painful reminder of the Battle of Britain. Then, in 1955, the Royal Air Force undertook to restore St. Clement's as the church of the RAF. Britain's air arm rebuilt what aggressor airpower had destroyed. Three years later, in 1958, St. Clement Danes was reconsecrated. It became a shrine to British, Commonwealth, and American airman killed in defense of freedom.

Today eight Books of Remembrance containing the names of RAF dead, and one dedicated to the 19,000 Britain-based American airmen who lost their lives in World War II, have been enshrined around the walls of the church. The American roll of honor was dedicated on Sunday, May 7. More than 600 dignitaries assembled in the rebuilt church for the ceremony. Air Force leaders from the US, Germany, and Great Britain attended the special service. Brig. Gen. Robert P. Taylor, Deputy Chief of Air Force Chaplains, delivered a moving sermon.

Col. William F. Taylor, Chief Chaplain of USAF's Third Air Force, presented the white, leather-bound book to the RAF chaplain in chief. He said, "It is with the earnest hope and prayer of every American that this memorial will serve not only as a tribute to the heroic endeavor of those who paid the supreme sacrifice . . . but also provide a constant reminder to your nation, and to ours, of the ties which bind us together in the cause of freedom."

An inscription on the wall over the book where it now reposes reads: "To the glory of God and in memory of United States airmen who made the supreme sacrifice during the second World War." On the two sides of the book is inscribed the closing passage of Lincoln's Gettysburg Address containing the pledge "that these dead shall not have died in vain."—END

were made in the early '50s. The first was made by the late Col. Dave Schilling in September 1950 when he flew an F-84 over the 3,300-mile distance in ten hours and one minute. The first USAF B-47 wing, the 306th, made the first overseas jet-bomber-wing deployment in June of 1953 to Fairford, England. The following month a jet bomber flew from Maine to England, 2,925 miles, in four hours and forty-three minutes. The first tactical unit with an atomic capability to be deployed overseas was the 49th Air Division, which set up on British bases in 1952 to give the NATO Commander his first real tactical strength. America's first intermediate-range ballistic missile, the Thor, had its initial overseas deployment to British sites in 1958. Today, a Ballistic Missile Early Warning System (BMEWS) station is under construction in Britain to alert allied forces of possible missile attack.

One thing has stayed constant with the years. That is the strategic location of Britain. General Spaatz in 1942 wrote that, in his opinion, England was the "only base area from which to launch aerial operations to obtain air supremacy over Germany." Today the island, once called an "unsinkable aircraft carrier" by Sir Winston Churchill, still is important to airpower. Despite poor weather which hampers training, SAC has used UK bases for twelve years in its global strategy, and the NATO Commander has found it a valuable tactical air backup for his European defense strategy.

It's not only geography that makes Britain a key bastion of aerospace power. Twenty years of cooperation between the RAF and the USAF have led to close integration of operations. The Royal Air Force for years has handled air defense responsibility for US units in the country, freeing them for tactical roles. Air-sea rescue is also handled by the RAF, and recently the Third Air Force adopted British-developed rescue beacons which can be worn on the waists of downed pilots. These send out signals picked up by the RAF air-rescue monitoring station and ensure that help will be on the way

—US Air Force photo

Lesson in the simple pleasures. USAF colonel teaches British churchman how to barbecue a hot dog at a US base.

in quick time. Recent exercises have proved the feasibility of midair refueling of USAF fighters from RAF tankers and vice versa. Close coordination exists between the two services in operational planning, intelligence, and electronic countermeasures.

Perhaps the closest integration lies in the Thor missile operation where USAF officers are responsible for the atomic warheads of the weapons while the RAF is charged with manning the Thor bases. The bases used by the USAF have been jointly developed, with the two countries sharing the more than $350 million cost.

General Ives doubles as Chief of the US Military Assistance Advisory Group in Britain and Third Air Force Commander. He places a high premium on cooperation. Says General Ives: "Perhaps nowhere in the world is there a better example of cooperation in military affairs than that which exists between the USAF and the RAF."

General Ives, as the USAFE Commander in the UK, and Maj. Gen. Charles B. Westover, Commander of SAC's 7th Air Division, are responsible for a strategically located and highly potent chunk of US aerospace power. General Ives has three tactical fighter wings, a tactical reconnaissance wing, and a fighter-bomber wing under his command, numbering more than 300 aircraft. These are at the ready and committed to the NATO Commander in time of war. General Westover controls four bomber bases in the Midlands which are used by SAC bombers flying regularly from US bases for short stays in Britain. He also monitors the US part of the Thor mission.

In support of the US military mission in the UK there are today 37,800 people, about ninety-five percent of them Air Force personnel. Counting dependents, the number of Americans in Britain runs over 80,000, most of them in the southeast quarter of the country. Most of these people live in British communities and spend about forty percent of their money on the local economy. Community relations are excellent—and have been for the past twelve years. The more than 5,000 British civilians directly employed by the US military on bases are a valuable asset.

Today's force might seem small compared to the World War II force with its thousands of bombers and fighters, but one of today's aircraft carries the punch of all the World War II planes that were stationed in Britain. Also, the Air Force mission in Britain is not strictly a tactical flying mission; in fact, the tactical role is declining. Today, the major construction effort is on the BMEWS station located at Fylingdales in Yorkshire which will give the West a warning of possible missile attack. Here again Britain and America are sharing the cost and the workload.

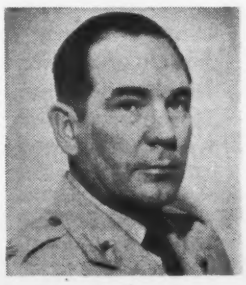
Recently the US Navy located a Polaris submarine tender and repair vessel in Holy Loch, Scotland, which adds even further to the strategic importance of Britain in the US defense picture.

Perhaps the most amazing part of this twenty-year relationship is the informal solidarity on which it rests. There has never been a formal or legal basis for the US presence in the country during the postwar years. Both political parties in Britain have accepted the US-British partnership in airpower as a necessary requirement in the interests of common defense. The Labor Government under then-Prime Minister Clement Attlee invited in the USAF in 1948. The Conservatives who took power in 1951 supported and continued this invitation. Despite almost constant propaganda blasts and threats from the Soviet Union over the presence of USAF bases in Britain, the arrangement has remained firm throughout the years, though there has been some political opposition.

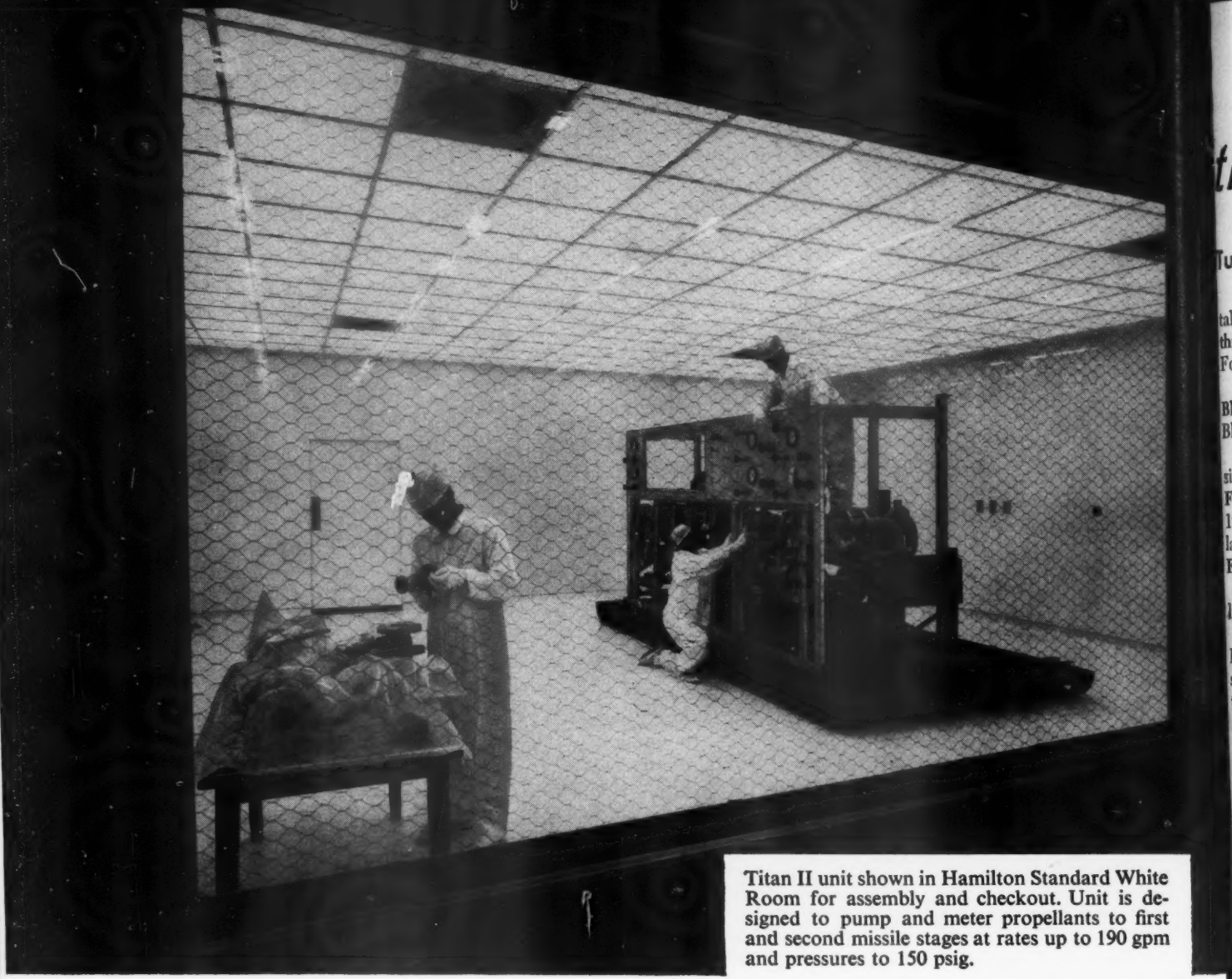
During Suez, some Conservative elements, ruffled because of the US position on that sensitive issue, questioned the continued presence of the bases. The arrival of the Thor missile, the RB-47 incident, and the Polaris tender announcement brought forth new opposition from some Labor supporters. But, in general, the British have come to accept the American presence as essential to the defense needs of the West. In doing so, they have, as Churchill put it, placed themselves in the front line should there be a third world war.

"The greatest proof of the effectiveness of the USAF-RAF partnership in the past twelve years of cold war," says General Ives, "is the fact that we have never had to fly a mission of violence from bases in Britain. I doubt if this would have been the case had the partnership not existed."

Defense policies of both the US and Britain indicate a continued reliance on the solidarity of the alliance. Both the US and Britain are committed firmly to a strong western alliance, both nations seek a workable disarmament agreement with the Communist world, and both nations seek to preserve the basic values of human freedom and dignity which they share in common. And the unique USAF-RAF partnership for survival remains an essential element of the common effort.—END



The author, Major Spence, is Director of Information for the Third Air Force at its headquarters near London. He has served in the information field in this country in Asia, and in Europe for the past two decades. Major Spence joined the Air Force twenty years ago at the start of World War II—shortly before the aerospace cooperation of which he writes came into being. In his current assignment, Major Spence has seen the US-British aerospace partnership in action in its numerous facets throughout the United Kingdom.



Titan II unit shown in Hamilton Standard White Room for assembly and checkout. Unit is designed to pump and meter propellants to first and second missile stages at rates up to 190 gpm and pressures to 150 psig.

White room for the Titan II propellant transfer system

Development and production of equipment for handling extremely volatile missile fuels—like the propellant transfer unit for The Martin Company's Titan II—demands a contamination-free environment, controlled to within 0.3 microns. Hamilton Standard's new White Room, especially designed for building missile fuel handling systems, even surpasses the exacting requirements of a hospital operating room. It provides 900 square feet of ultra-modern assembly and testing equipment. Detailed construction care and strict control procedures will maintain immaculate conditions . . . always.

Building a propellant transfer unit for the Air Force Titan II missile program is just one of several recent GSE projects in which extreme cleanliness has been a major consideration. This package unit is skid-mounted, electrically powered, manually controlled (with automatic safeties), and capable of pumping either fuel or oxidizer. Performance is measured by its ability to absolutely contain toxic fluids and vapors. To meet these requirements, Hamilton Standard developed important new concepts in sealing and system reliability.

The White Room's capabilities work hand in hand with other key controls to provide manufacturing quality, functional reliability, low system cost, and on-time delivery of all Hamilton Standard Ground Support Equipment.

For the solution to your missile fuel handling problems . . . or any GSE assignment from miniature components to complete weapon support systems, phone: Manager, Ground Support Equipment Department, Hamilton Standard, Windsor Locks, Connecticut; or write for illustrated brochure.

UNITED AIRCRAFT CORPORATION

HAMILTON STANDARD DIVISION

GROUND SUPPORT EQUIPMENT

the Ready Room

RESERVE AND AIR GUARD NEWS

Turning Point

Lt. Gen. William E. Hall, Commander of the Continental Air Command, will retire **September 30** after more than **thirty-two years' service**—the last ten with the Air Reserve Forces.

General Hall will be succeeded by **Maj. Gen. Gordon A. Blake,** Vice Comander of the Pacific Air Forces. General Blake will assume **three-star rank.**

General Hall has been a leader in the **Reserve program** since January 1951 when he assumed command of the **Fourth Air Force at Hamilton AFB, Calif.** In the fall of 1952 he became **Vice Commander of CONAC,** and a year later was assigned as **Assistant Chief of Staff for Reserve Forces.**

He was named **CONAC Commander** and promoted to lieutenant general in July 1957.

No individual has played a greater role than General Hall in bringing the Air Reserve Forces to the **highest state of training and readiness in history,** overseeing their transition from an assembly of week-end warriors with nebulous mission assignments to **hardened, well knit forces** capable of handling key Air Force tasks.

General Blake, CONAC's new commander, is fifty-one, an Iowan, **a 1933 graduate of West Point,** and a command pilot. During World War II he commanded the **Airways and Air Communications Service** in the Pacific. In the mid-1950s as **Director of Communications** at Hq. USAF and later as **Assistant Deputy Chief of Staff for Operations,** he played an important part in development of the **DEW Line radar network.** Before going to Hawaii with **PACAF,** he commanded the **USAF Security Service** at Kelly AFB, San Antonio, Tex.

In other key actions affecting the Reserve Forces:

● **Ben Fridge,** a Reserve brigadier general and former Deputy for Reserve and ROTC Affairs in the Air Force Secretary's office, has been appointed **Special Assistant to the Secretary for Manpower, Personnel, and Reserve Forces.**

A native of Alexandria, La., and a 1938 graduate of Louisiana State University, Mr. Fridge has been an **active Reservist for many years,** and is a member of **AFA's Air Reserve Council.** He was president of the Baton Rouge, La., chapter of the Reserve Officers Association shortly after World War II. When he moved to California in 1950 he qualified as a Reserve jet pilot and later served as **Deputy Commander of the Reserve's 349th Troop Carrier** Wing at Hamilton AFB, Calif.

Mr. Fridge succeeds **Lewis F. (Pinky) Thompson,** who left government service early this year. For the past year Mr. Fridge has been associated with an Arlington, Va., construction firm. Before that he was Mr. Thompson's Deputy for Reserve and ROTC Affairs.

● **Maj. Gen. Chester E. McCarty,** a career Reservist who has been **Deputy for Air Force Reserve** under the Assistant Chief of Staff for Reserve Forces, has been named **Vice Commander of USAFE.** He will be succeeded by **Brig. Gen. Ivan W. McElroy,** Twelfth Air Force Deputy for Operations.

General McElroy, a forty-eight-year-old native of Austin, Tex., has been a fighter pilot and commander ever since he completed pilot training following graduation from **West Point in 1937.** As commander of the **"Burma Banshees"** in the CBI theater in World War II, he led an assault on a Japanese force of twenty-five fighters and fifteen bombers in which his formation destroyed all twenty-five fighters and fourteen of the fifteen bombers without losing a plane. He has been **Deputy for Operations** at Twelfth Air Force since August 1960.

In their new assignments, Generals Blake and McElroy will work closely with Ben Fridge and his **Deputy for Reserve and ROTC affairs.** In fact, in Mr. Fridge's Reserve capacity, he is **mobilization assignee** to the post to be held by General McElroy. Ben will also find common ground for reminiscing with Generals Blake and McElroy about World War II experiences. He served in the Pacific as a bomber pilot.

—US Air Force photo

Lt. Gen. William E. Hall, left, who has commanded CONAC since 1957, retires September 30. He will be succeeded by Maj. Gen. Gordon A. Blake, right, now Vice Commander of Pacific Air Forces, being promoted to three-star rank.

● **Brig. Gen. J. M. Chappell,** Commander of the Air Reserve Records Center, Denver, Colo., will retire on June 30. Assuming command of the ARRC on August 1 will be **Brig. Gen. James L. Riley,** currently Deputy Director for the Secretary of the Air Force Personnel Council in Washington. An Air National Guardsman, General Riley was recalled to active duty in 1950 after five years of active service during World War II. He was with the **Air Materiel Command** until 1954, at which time he became a member of the Personnel Council. A year later General Riley was appointed the **Council's Deputy Director.** General Riley, a native of Atlanta, Ga., is a rated senior pilot. He was a lawyer in civil life.

Memo from the Councils

AFA's Air Reserve and Air Guard Councils held their **second and third meetings of the year,** respectively, in **Colorado Springs in June** in conjunction with a meeting of the Association's National Directors.

The Councils **recommended** that the Air Force Association:

● **Commend the Air Reserve Forces** for their **outstanding contribution to national security** and give them a vote of confidence in the pursuit of their assigned objectives;

● Continue to **pursue equalization of per diem** for Reservists and Guardsmen;

● Call for a **unified DoD program on screening Reservists** who are designated key federal employees;

● Request the Air Force to **consider selection of outstanding Reserve Forces officers for Regular USAF com-**

(Continued on following page)

missions in the forthcoming augmentation of 13,000 officers to the active USAF establishment;

- **Support the DoD amendment to the Officer Grade Limitation Act,** which would provide relief to the Air Force.
- Establish a **joint committee of the two Councils** to study ways and means for members of the Air Reserve Forces to **participate more effectively in AFA's aerospace education program.**

In addition, the Air Guard Council asked AFA to **recommend to the Air Force that briefings on the Air Reserve Forces be included in the curriculum at armed forces service schools.** The Guardsmen also asked AFA to study the problem of **replacement of ANG C-47** transports with **more modern "off-the-shelf" cargo aircraft.**

The Air Reserve Council reported it was considering establishment of a **permanent committee to study long-range roles and missions for the Air Force Reserve.** Other problems confronting the Reserves are to be discussed further by the Council at its third meeting of the year **in Louisiana in mid-August.**

Air Force Secretary Eugene Zuckert, right, swears in Ben Fridge as his Special Assistant for Manpower, Personnel, and Reserve Forces. Fridge, a Reserve brigadier general, was Deputy for Reserve and ROTC Affairs from 1957 to 1960.

—US Air Force photo

Swift Strike

There's **trouble brewing** on the border—the border, that is, between **North and South Carolina**—as the **Army and the Air Force** prepare to conduct **Exercise Swift Strike** August 6 to 20.

The Army will employ **some 15,000 men of the 82d and 101st Airborne Divisions.** But the bulk of Air Force participation will be provided by the **Air Force Reserve and the Air National Guard.**

Air elements in the exercise are under command of **Maj. Gen. Maurice A. Preston,** Commander of the Tactical Air Command's Nineteenth Air Force. His deputy is **Maj. Gen. Charles H. DuBois,** Commander of the 131st Tactical Fighter Wing, Missouri ANG. In charge of Army components is **Lt. Gen. Paul D. Adams,** Commanding General of the Third US Army.

The Air Force Reserve will be represented by six troop carrier wings flying **almost two hundred C-119** aircraft. The wings are the **433d,** Kelly AFB, Tex.; **434th,** Bakalar AFB, Ind.; **440th,** Milwaukee, Wis.; **459th,** Andrews AFB, Md.; **464th,** Pope AFB, N. C.; and the **512th,** Willow Grove, Pa.

In addition, **Brig. Gen. John S. Bagby,** the 512th Wing Commander who heads the airlift force, will employ **C-123s and C-130s** supplied by TAC and **C-124s** from MATS. Assisting in operations are four aerial support squadrons—the **11th** of Hanscom Field, Mass.; **14th,** Kelly AFB, Tex.; **16th,** Bakalar AFB, Ind.; and **18th,** Andrews AFB, Md., plus the **52d Casualty Staging Group,** Scott AFB, Ill., and the **42d Squadron** of San Diego, Calif.

Tactical air forces, under command of **Brig. Gen. Frank Bailey** of the Arkansas ANG, include both Air Guard and TAC units. Ohio's **121st Tactical Fighter Wing** will deploy twenty-five **F-84Fs** into the exercise area. The **180th Tactical Reconnaissance Squadron,** St. Joseph, Mo., will provide twelve **RF-84Fs,** and the **154th TR Squadron,** Little Rock, Ark., and **164th TR Squadron,** Louisville, Ky., will furnish four **RB-47s** each.

TAC will turn over to General Bailey a fighter force of **thirty aircraft**—F-100s, F-104s, and F-105s.

Air Guard SA-16s of the **130th Troop Carrier Squadron,** Charleston, W. Va., and the **135th,** Baltimore, Md., will provide airlift for special forces guerrilla units.

The Guard's **123d Aircraft Control & Warning Squadron** of Blue Ash, Ohio, and the **112th AC&W Flight** of State College, Pa., will provide ground control for fighter and reconnaissance planes.

In the exercise "scenario," US forces are called upon to **help defend the small nation of Boluca,** a free-world ally, against an attacking force which has invaded Boluca from **Carlotta,** an adjoining aggressor satellite.

The maneuver area covers a rectangle 100 miles long by thirty miles wide, ranging from **Aberdeen, N. C., to Camden, S. C.**

Tactical fighters will scour the area, **attacking enemy fighters, providing air cover for airborne assaults, and hitting ground targets** earmarked by reconnaissance planes, such as highway and rail bridges, road junctions, and troop concentrations.

Use of nuclear weapons may be simulated, but only if aggressor forces use them first.

Six for the Ricks

Six **Air Guard C-97 transport squadrons** will enter crews in the **1961 Ricks Trophy event.**

The Ricks Trophy is awarded by the **Air Force Association** at its National Convention to the individual or crew winning **an annual competition** under rules **prescribed** by **the National Guard Bureau.** The Convention is at **Philadelphia** this year.

The trophy honors the late **Maj. Gen. Earl T. Ricks,** former chief of the Air Force division in the National Guard Bureau.

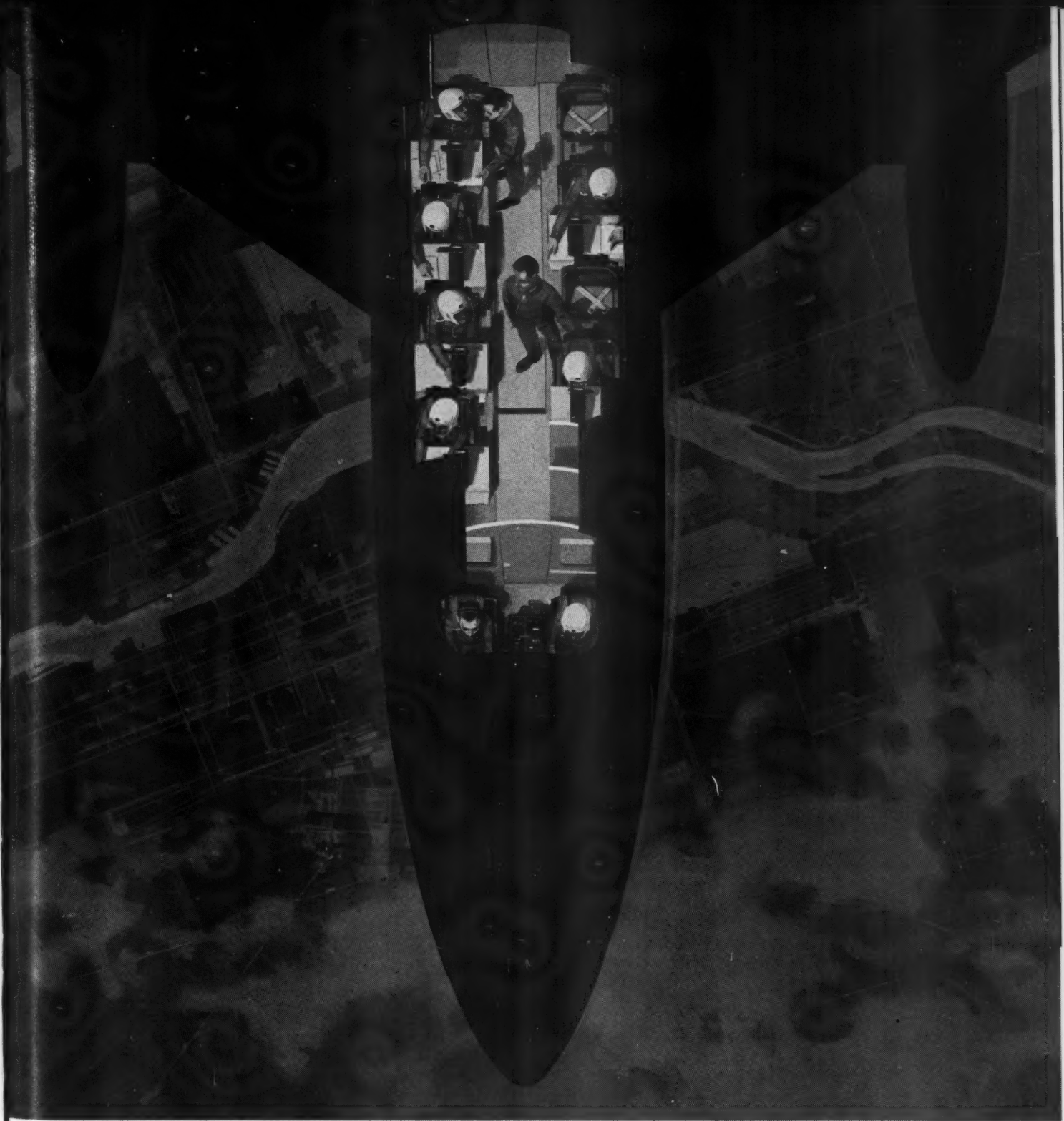
As in recent years, the Ricks Trophy competition will be in the form of an **operational exercise** rather than a speed run. In the 1961 event, Air Guard squadrons which have been flying the Boeing C-97 Stratofreighter **for a year or more** will compete in a **typical MATS transoceanic cargo mission.**

Squadrons eligible to enter are the **109th,** Minneapolis-St. Paul, Minn.; **125th,** Tulsa, Okla.; **133d,** Manchester, N. H.; **139th,** Schenectady, N. Y.; and the **115th** and **195th,** Van Nuys, Calif.

Each squadron will **enter one crew,** composed of pilot, copilot, navigator, flight engineer, and loadmaster. Crews will be rated on such factors as **flight planning, navigation, meeting block times, fuel consumption, and cargo tie-down.**

The event will be run **prior to the AFA Convention,** September 20-24, with the winners and second-place crews flying into Philadelphia as AFA's guests.

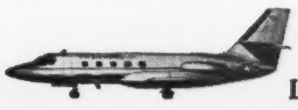
Last year's Ricks Trophy winner was **Maj. Milan R. Forkapa, Jr.,** Commander of the **112th Tactical Fighter Squadron, Toledo, Ohio,** in a competition involving **F-84F** jet fighters.—END



New 10-place jet trainer

The Lockheed C-140 is a compact jet transport. It flies fast and high like jet fighters and interceptors – at just a fraction of their operating and maintenance cost. It can train an entire class of students for hours at a time, rather than one man for a few minutes. And students learn the fine art of operating radar and weapon control systems in tactical and strategic aircraft in a favorable environment, because the C-140's entire cabin is pressurized and air-conditioned. Students see the real thing on their radarscopes and instruments. The Lockheed C-140 also can stretch defense dollars when used for navigational aids checking, casualty evacuation, aerospace system flight testing, and for high priority cargo and passengers.

LOCKHEED GEORGIA



Lockheed Aircraft Corporation, Georgia Division, Marietta, Georgia.

The Air Force Academy held its third Commencement on June 7, commissioning 213 new second lieutenants into the Air Force. One of the glittering features of June Week leading to Commencement was the second AFA Honor Squadron Dinner . . .

TROPHY NIGHT AT THE ACADEMY

—US Air Force photo

At the AFA Honor Squadron Dinner on June 1 honoring the Air Force Academy's 13th Cadet Squadron, from left: AFA President Thos. F. Stack; USAF Chief of Staff Gen. Curtis E. LeMay; Cadet Lt. Col. George L. Butler, Commander of the Honor Squadron; radio-TV's Arthur Godfrey; retired Lt. Gen. James Doolittle.

I THOUGHT that my first day at the Academy was the greatest day of my life. Now I've changed my mind. This is greatest thing that ever happened to me."

So spoke a member of the Air Force Academy's 13th Cadet Squadron on the night of June 1, when AFA paid tribute to the 13th as the Academy's Honor Squadron. The Association presented its annual trophy to the Squadron at the second AFA Honor Squadron Dinner. This was the third year the trophy had been presented. The dinner, aglitter with Air Force stars, was once again a major feature of June Week at the Academy. At the end of the week, on June 7, the Academy held its third Commencement—commissioning 213 second lieutenants into the Air Force and two each into the Army and Marine Corps.

Many factors enter into the selection of the Honor Squadron each year: the precision the Cadets display in weekly drills, the number of times individual upperclassmen make the Dean's List, the way the squadron marches to meals. Most of all, the Honor Squadron is chosen on the basis of academic merit.

AFA National President Thos. F. Stack presented the Association trophy to Cadet Lt. Col. George L. Butler of Arlington, Va., Commander of the 13th Squadron. Cadet Butler observed that the members of the squadron deserved full credit for attaining their honor status.

"As Squadron Commander," he said, "all I did was sit back and let the Squadron earn the award."

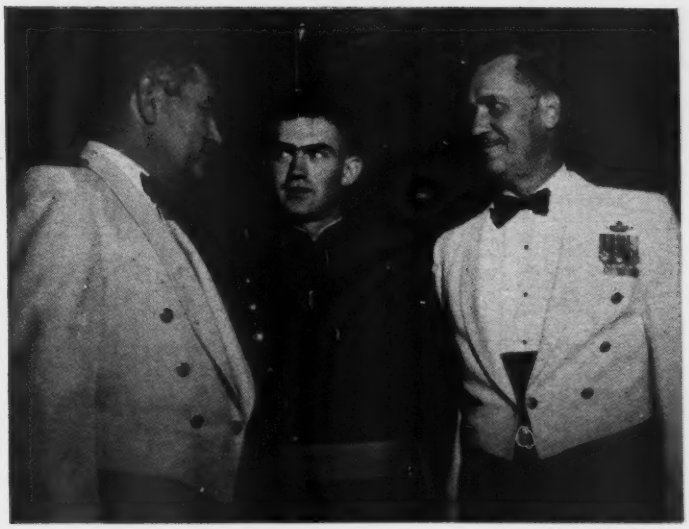
Cadet Butler also received an honorary life membership in the Association. Each member of the 13th was made an honorary member for one year.

There are sixteen Academy awards presented annually to Cadets for displaying meritorious academic proficiency. Two Cadets, both members of the 13th Squadron, won nine of these awards between them this year. Cadet Capt. John D. Sullivan, Jr., of Worcester, Mass., was top man with five. Cadet Maj. Oleg R. Komarnitski, Coraopolis, Pa., took four.

Retired Lt. Gen. James H. Doolittle, AFA's first President, served as toastmaster for the banquet at Ent AFB Officer's Mess. Ent, with the Academy, is located at Colorado Springs. Gen. Curtis E. LeMay, USAF's new

—US Air Force photo

Arthur Godfrey talks with Brig. Gen. Robert F. McDermott, Academy Dean of Faculty, at the Honor Squadron Dinner. Mr. Godfrey delivered an address.

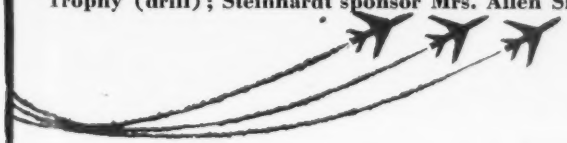


—US Air Force photo

Chief of Staff LeMay and Maj. Gen. William S. Stone, the Superintendent of the Academy, with the number-one Cadet in this year's graduating class, Cadet John D. Sullivan.

—US Air Force photo

Right, top cadet squadron commanders with awards. From left, 13th Squadron's Cadet Lt. Col. George Butler with AFA Award; AFA President Stack; AFA Director Don Olson; 10th Squadron's Cadet Lt. Col. Carl Renoud with Malanaphy Award (intramural sports) and Steinhardt Trophy (drill); Steinhardt sponsor Mrs. Allen Sherlock.



Chief of Staff, headed the guest list. General LeMay and Arthur Godfrey, the TV-radio-aviation personality, delivered eloquent addresses to the gathering.

"Our goal is to make the Academy the best university in the country," General LeMay said. "We expect great things from Academy graduates in the future, and we know we will get them."

He told the Cadets they would find their futures both in "the flying business" and in space. So far as space was concerned, he said, it is important to develop our national capabilities "fast."

"When we get out there, I, for one, don't want to see any Russians flying around," he declared.

Mr. Godfrey, free-wheeling humorist on many such occasions in the past, turned serious attention to the place of professional military men in American society. He called on the Cadets to strive for competence and integrity as Air Force officers in a time of US and free-world peril.

Maj. Gen. William S. Stone, Superintendent of the Academy, kicked off the festivities with a resume of the 13th Squadron's rankings in the various activities which earned it the coveted Honor Squadron designation. Eighty-four Cadets of the Squadron were at the banquet. Then General Doolittle introduced top AFA leaders present. The annual meeting of the Association's Board of Directors was being held at Colorado Springs.

Col. Benjamin Cassiday, Vice Commander of ADC's 78th Fighter Wing, Hamilton AFB, Calif., who served for three years as Deputy Commandant of Cadets at the Academy prior to assuming his present assignment, was on hand representing the 13th's "sponsor" organization, his current outfit. Every Cadet Squadron is sponsored by an active-duty USAF unit.

Among those at the head table were RCAF Air Marshal C. Roy Slemon, Deputy Commander in Chief, NORAD; Lt. Gen. Robert M. Lee, Commander, ADC; Colorado Springs Mayor William C. Henderson; AFA Board Chairman Howard T. Markey; Don Olson, AFA Director who is also Chairman of the Colorado Springs Airpower Council, Sponsor of the Honor Squadron Dinner; Col. Alvan N. Moore, Commander, 6594th Satellite Test Wing, Sunnyvale, Calif.—END

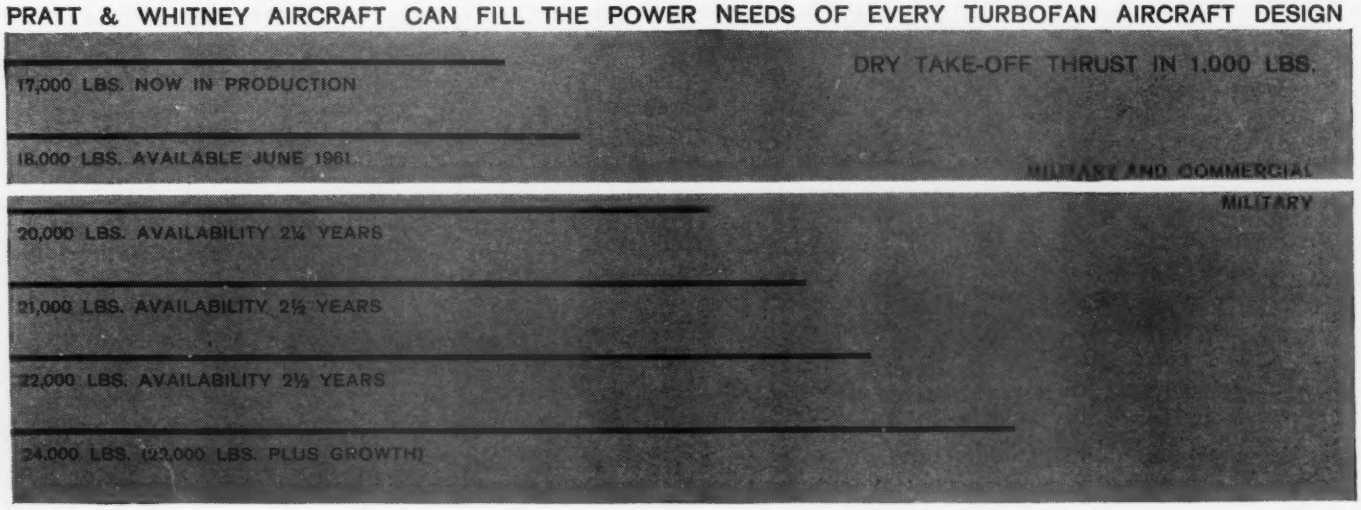
JT3D

A progression of turbofan power.

JT3D designates a whole group of twin-spool, turbofan engines designed and built by Pratt & Whitney Aircraft, as shown in the power growth chart below. These turbofans are the offspring of the record-making J57 jet engine. The turbofan uses approximately 15 per cent less fuel at comparable cruising thrust than the conventional jet. Pratt & Whitney Aircraft's JT3D family provides a broad range of available power—17,000 to 24,000 pounds of take-off thrust, or more. This thrust increase can be accomplished with little effect on the radial size of the engine, and with a substantial decrease in specific weight.

PRATT & WHITNEY AIRCRAFT Division of **UNITED AIRCRAFT CORPORATION**
East Hartford, Connecticut

PRATT & WHITNEY AIRCRAFT CAN FILL THE POWER NEEDS OF EVERY TURBOFAN AIRCRAFT DESIGN


DRY TAKE-OFF THRUST IN 1,000 LBS.
17,000 LBS. NOW IN PRODUCTION
18,000 LBS. AVAILABLE JUNE 1961
MILITARY AND COMMERCIAL
MILITARY
20,000 LBS. AVAILABILITY 2¼ YEARS
21,000 LBS. AVAILABILITY 2½ YEARS
22,000 LBS. AVAILABILITY 2½ YEARS
24,000 LBS. (22,000 LBS. PLUS GROWTH)

TECH TALK

J. S. BUTZ, JR.

Ultimate success of the **US space program,** in both its civil and military versions, depends **primarily on costs.** Today, the direct operating cost of putting **payload into a 300-mile orbit** above the earth is approximately **$3,500 per pound.** If this cost is not **reduced substantially** during the next few years, it **will be impossible** to orbit many millions of pounds of payload **during the years 1965-1970** as presently envisioned by US space planners.

Studies by USAF and NASA indicated that it may be possible **to cut direct costs by about seventy percent** before 1965. This reduction to **about $1,000 per pound** will come primarily from **greater experience** in manufacturing and launch operations, the use of **larger and more advanced vehicles,** and the use of **more efficient hydrogen fuel.**

Early in the next decade, **around 1972,** it is believed possible to lower direct operating costs **to $100 per pound.** To reach this goal, we must **perfect booster and upper-stage recovery** to a fine art by about 1965.

Some of the specialists studying the cost picture believe that **direct costs can be lowered** by an order of magnitude **every seven years,** from now until 1980. If this proves true, it will **cost only $10 per pound to orbit a payload** close to the earth **in 1979.** Vital assumptions in this prediction are **operational nuclear rockets** and **full recovery and reusability** of launch vehicles during the 1970s.

Two Air Force programs may end up having a dominant influence on the effort of lower launch costs. The first is the multimillion-pound-thrust **solid-propellant superbooster program** which will receive $62 million to begin work in fiscal 1962. Primary goal of this program is to **reduce complexity, launch time, and the cost of big boosters.** The proponents of solid rockets **have predicted costs** over current costs with liquid-fuel rockets. It should be possible to check these predictions positively **within two or three years** if the present Air Force program is **allowed to run its course.**

The **second project** which could materially affect launch costs is the **aerospace plane.** The aerospace plane's projected ability to take off and land on **conventional runways,** its total **recoverability and reusability,** its **safety** in case of mission abort, all would

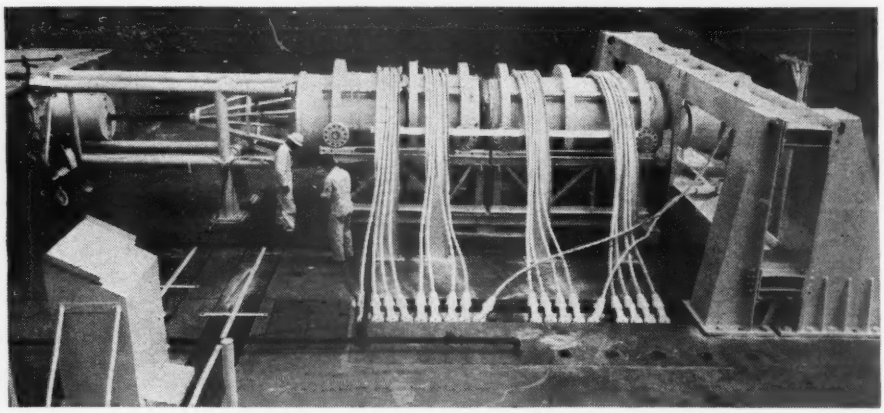
(Continued on following page)

Mockup of a 2.5-million-pound-thrust plug rocket engine proposed by General Electric Company is shown above. Propellant combustion in this engine takes place in approximately 100 small combustion chambers lined up side by side in the large ring at the top of the engine. This engine would not gimbal, and its thrust direction would be controlled by changing the combustion pressure in a portion of the combustion chambers. Small plug-nozzle engines are in test.

The test engineer at left is hovering in Bell Aircraft's hydrogen-peroxide rocket belt developed for the Army. Original purpose of the rocket is to allow infantry to move quickly across obstacles such as rivers, wire, mine fields, etc. More than thirty test flights over distances up to 150 feet per leap have shown that the unit is stable. The Air Force is interested in the rocket belt to propel men in orbit.

place it in a completely **different economic class** from currently planned rocket vehicles.

As the basic transportation phase of the US space program approaches an **airline-type operation** in both frequency of flights and the need for maintaining a schedule, the aerospace plane becomes **much more attractive.** Few people examining space programs believe that the firing schedule of large rockets **such as Saturn and Nova** can be kept below one a week after 1970. Supporters of the aerospace plane concept predict that it could meet the airline-type requirements with a direct operating cost of **well under $100 per pound** of payload delivered. The assumption of nuclear propulsion is **not included** in these predictions.



Solid-propellant rocket engine built in two segments by the Aerojet-General Corp. under Air Force contract in shown above just prior to firing. This sixty-five-inch-diameter unit produced 160,000 pounds of thrust. In later tests Aerojet-General fired a three-segment engine which developed 470,000 pounds of thrust for more than forty seconds. Before the year is out the company will fire a one-million-pound-thrust engine built in six segments. All the engines use single nozzles.

Under the best development circumstances, with a high national priority, an **operational aerospace plane** undoubtedly couldn't be available **for ten years.** As the government peers into the future, trying to determine the nation's space requirements, it is **impossible to say** whether the aerospace plane will be granted a **high priority in time** for it to be used effectively in the early 1970s. **Less than $100 million** will have been spent on it through **fiscal 1962.**

Predicting costs in the space program is admitted, by all concerned, to be a **tenuous process** today. Not only the **magnitude** but the **distribution of costs** must be known within close limits if sensible measures are to be taken to cut expenses on future projects.

Estimates of direct operating costs quoted above are the **best that can be made with current experience.** By definition the direct operating costs are all **recurring costs** which include: **vehicle production, propellant, vehicle transportation, vehicle launch, maintenance and repair of recoverable vehicles, crew, and capital cost.**

In order to estimate the **total cost of the space program,** the **indirect operating costs** must be considered. When these are added, the total cost of sending a pound of payload into orbit **increases by a significant amount.** Indirect costs are: **range cost and general overhead, ground-support-equipment costs, launch-facility cost, vehicle-development cost, and other non-recurring costs.** Some of these expenses, such as range cost, are carried as **line items** in the budget of the responsible agency. However, a concerted effort is being made to overcome the **many obstacles presented by government bookkeeping** procedures. The desire is to approach the total space program through **true systems analysis.**

One of the first results of these studies has been to point up the **overall cost savings** which result from **high launch-pad utilization.** As a consequence, a great effort is being made to achieve a **low launch-pad time** for all new vehicles.

* * *

A recent example of interservice assistance involves **Army tests** with the **Air Force-General Electric M61 "Vulcan,"** a six-barreled, twenty-millimeter aerial cannon. Test agencies in the Army report that this weapon will require **only slight modification** in fire control and feed systems for use on **light ground vehicles.** It is regarded as a simple, economical, **highly accurate weapon.**

Using the Vulcan cannon, scout car gunners have been able to set **new standards** for delivering overwhelming fire quickly against surprise targets. This Gatling-gun-type weapon has demonstrated that it can **destroy lightly armored personnel vehicles** and gun carriers and that it can severely **damage light and medium tanks.**

Armor experts are **highly enthusiastic** about the M61. Many of them believe that the slightly modified Vulcan has been **tested thoroughly** enough during the last two years to allow it to **enter service in quantity** within six months after the top-echelon go-ahead is given.

* * *

The Air Force's vital applied-research program to develop **large solid-propellant rockets** recently passed two major milestones. On May 9, the **Aerojet-General Corporation** fired a sixty-five-inch diameter, **twenty-five-ton engine** producing 160,000 pounds of thrust. This was the **largest segmented rocket engine fired to that date.** Its two segments (*see cut*) were secured together using a lock-strip joint.

Less than a month later Aerojet fired a **100-inch diameter, fifty-five-ton, three-segment engine** which developed **470,000 pounds of thrust** for over forty seconds. This was the **largest** solid-propellant rocket that has ever been fired.

Later this year Aerojet will fire a **six-segment engine** producing **1,000,000 pounds of thrust.** A **single nozzle** will be used on this engine as it has on the two previous test engines.

The advanced state of solid-propellant rocketry provides a **strong argument for aggressive applied research programs.** For a number of years the Air Force and the Navy have funded **rather large** solid-rocket programs directed toward **improving the state of the art** rather than meeting a particular **weapon requirement.** These programs included **extensive experimental work on problems** such as: **propellant chemistry, materials for nozzles** and **engine cases,** and **lightweight mechanisms for thrust-vector control** and to shut engines down precisely. Both the **Minuteman** and the **Polaris** missiles drew heavily on the data from these programs. In each case the feed of information was **across service lines.**

The large solid engines now being fired by Aerojet are the **latest** in this state-of-the-art program. In many ways their test results will speed the development of the **solid-propellant superboosters** which are now the Air Force's responsibility.—END

Last Chance to Register in Advance for AFA's 15th ANNIVERSARY CONVENTION and PANORAMA

PROGRAM

Wednesday,
September 20

2:00 PM	AFA Directors Meeting
7:30 PM	AFA Leaders Meeting

Thursday,
September 21

9:00 AM	Reserve Forces Seminar
10:00 AM	Aerospace Briefing
12:30 PM	15th Anniversary Luncheon
3:00 PM	Aerospace Briefing
3:00 PM	1st AFA Business Session
7:00 PM	Panorama Preview Reception

Friday,
September 22

9:00 AM	2d AFA Business Session
9:00 AM	Aerospace Education Seminar
9:00 AM	Aerospace Briefing
11:00 AM	Aerospace Briefing
12:00 N	Aerospace Education Luncheon
12:00 N	Industry Buffet Luncheon
12:00 N	Panorama Open to Registrants
2:30 PM	Annual Symposium
7:45 PM	Awards Banquet

Saturday,
September 23

8:00 AM	AFA Honors Breakfast
9:00 AM	Arnold Air Society Meeting
11:00 AM	Aerospace Briefing
12:00 N	Panorama Open to Public
2:30 PM	3d AFA Business Session
2:30 PM	Aerospace Education Seminar
9:30 PM	Air Force Reunion Party
9:30 PM	Arnold Air Society Ball

Sunday,
September 24

12:00 N	Panorama Open to Public

PHILADELPHIA

September 20-24

1961

Advance Registration Closes August 28

Everyone is requested to register IN ADVANCE. Credentials will be required to attend meetings and the Panorama during "closed" periods.

Complete, Attach Payment, and Mail to AFA, 1901 Pennsylvania Ave., N.W., Washington 6, D. C.

ADVANCE REGISTRATION FORM FOR AFA'S 1961 CONVENTION

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TITLE .....

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ADDRESS .....

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Check ONE of the categories with which you wish to be identified:

☐ GOVERNMENT ☐ INDUSTRY ☐ AIR FORCE ASSOCIATION

☐ EDUCATION ☐ MILITARY ☐ PRESS-RADIO-TV

Check the type of registration desired, attach payment, and mail to:

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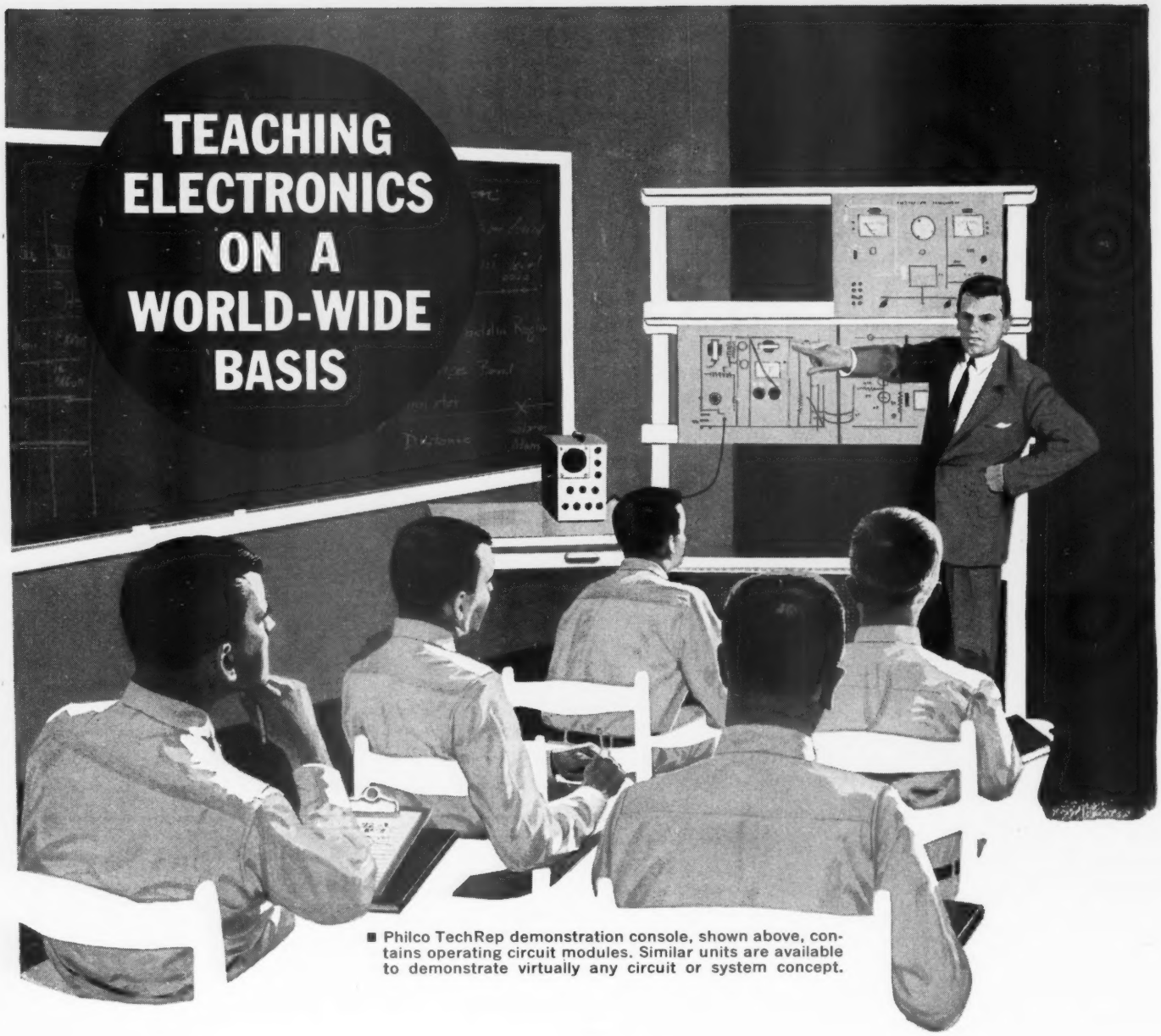
☐ **INDUSTRY REGISTRATION** **$35.00**
(Includes tickets and credentials to all Convention events including Industry Luncheon and Briefings)

☐ **REGULAR AND LADIES REGISTRATION** **$25.00**
(Includes tickets and credentials to all Convention events except Industry Luncheon)

☐ **BASIC REGISTRATION** **$10.00**
(Includes credentials, meetings, Panorama Reception, but not tickets to any of the other Convention events)

8-61

TEACHING ELECTRONICS ON A WORLD-WIDE BASIS



■ Philco TechRep demonstration console, shown above, contains operating circuit modules. Similar units are available to demonstrate virtually any circuit or system concept.

Personnel throughout the free world are being trained to teach, operate, and maintain virtually every type of electronic system—through retention-building Philco custom-tailored demonstrations.

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AFA NEWS

SQUADRON OF THE MONTH

Colin P. Kelly, New York Squadron, Cited for excellent programing and organizational support of the New York Wing, while acting as host squadron to the fourteenth annual Wing convention.

This is the season for **Wing conventions.** We're proud to report on five held recently of more than usual interest and success.

Leading the pack in size and effectiveness was the **New York Wing,** which met at The Beeches, Rome, N. Y., on June 17. **Nicholas Mammone,** Commander, and the officers and members of the **Colin P. Kelly Squadron** deserve much credit for the outstanding program they put together for more than 600 guests.

Three special Wing guests came in for a major share of the publicity. **Colin P. Kelly, III,** son of the World War II Air Corps pilot, who is now a Cadet at West Point, and **Mr. and Mrs. Alan B. Shepard,** parents of America's first Astronaut, were brought to Rome by the Wing and given VIP treatment for the **week end.**

Col. Raymond E. Hogan, Deputy Chief, USAF Space Systems Division, Inglewood, Calif., was guest speaker at the fourteenth annual Wing Awards Dinner. **Thomas C. Irvine** of Kirkville, N. Y., served as toastmaster. **Forrest L. Vosler,** Congressional Medal of Honor winner who is a former Wing Commander, received a standing ovation at the banquet.

Wing awards for 1961 were presented to **107th Tactical Fighter Group, NYANG,** for its support of AFA; to the **Falcon Squadron, Westchester, N. Y.,** as "Squadron of the Year"; and to **Robert E. Seiloff,** Wing Treasurer, as "Man of the Year." A special citation was presented to the Shepards.

At the annual business meeting, **Gordon Thiel** of DeWitt, N. Y., an executive with General Electric, was reelected Wing Commander. Elected to serve with him were **Mammone and Vito Castellano,** Vice Commanders; **Howard Eichner,** Corresponding Secretary; **Seiloff,** Treasurer; and **Irene Keith,** Recording Secretary.

Sharing the spotlight with New York for the oldest annual convention was **Massachusetts,** which also held its fourteenth meeting, on June 24-25, at the Madison Hotel in Boston. Top-notch business sessions marked the event. Highlight was the annual banquet, which this year had a Hawaiian motif, complete with Polynesian menu and atmosphere. It featured a troupe of hula dancers.

Stephen F. Tetlow, retiring Wing Commander, officiated at the dinner. He turned over the Commander's gavel to his successor, **Joseph E. Assaf,** of Hyde Park, Mass. Serving with Joe in the coming year will be **Her-**

(Continued on following page)

Regional Vice President Frederick W. Monsees, Lynbrook, N. Y., is shown as he installed New York Wing officers during fourteenth annual convention. They are, left to right, Robert Sieloff, Howard Eichner, Nicholas Mammone, Vito Castellano, Gordon Thiel, and Irene Keith. Seen at head table are Mrs. Alan B. Shepard, mother of America's Astronaut, and Mr. and Mrs. Forrest L. Vosler.

Shown during the Illinois Wing convention are, left to right, William Farina, Treasurer; Lee Cordell, Past Wing Commander and current member of Board of Directors; Bill Mathieson, Wing Commander; Kevin Brown, *Popular Mechanics* Aviation Editor, winner of Wing Airpower award.

Brig. Gen. Gordon H. Austin, USAF, was featured speaker at Pennsylvania Wing convention banquet. He's shown above with AFA National Chaplain Rev. William Laird, Haddon Heights, N. J.; Carl J. Long, Pittsburgh, member of the Board of Directors; Frederick Monsees, Lynbrook, N. Y.

bert E. Maguire, Medford, and **Arthur F. DeWaele,** Worcester, Vice Commanders; **Mildred H. Buck,** North Wilmington, Executive Secretary; **Irene T. Platt,** Rutland Heights, Recording Secretary; and **Paul A. Robinson,** Dorchester, Treasurer.

The dinner address was delivered by **Robert A. Spatola,** Executive Secretary, Sport Parachuting Commission of Massachusetts. Honored guests included **Arthur A. Riley,** aviation editor of the Boston *Globe,* and **Col. George Johnson,** military aide to Boston's Mayor John F. Collins.

May 27 was the date chosen by the **Pennsylvania Wing.** The **Erie Squadron** won a hotly contested debate to act as hosts for the thirteenth annual meeting of another of AFA's top Wings. **Edmund C. Jaworek,** Erie Commander and the other members of the Squadron gave the Wing delegates a program that has them all waiting to get back to the area.

State Senator William G. Sesler was toastmaster for the airpower banquet. The guest speaker was **Brig. Gen. Gordon H. Austin,** Deputy Director, Operational Requirements, USAF Headquarters. AFA's National Chaplain **Rev. William Laird,** Haddon Heights, N. J., delivered the invocation.

Stephen C. Yednock, Harrisburg, retiring Commander, delivered the annual report at the banquet. Then he turned the gavel over to his successor, **Robert V. Green,** also of Harrisburg, who had previously served as Wing Treasurer. **Richard Fay,** Pittsburgh, was chosen as Vice Commander, to serve with **Roger Ellis,** Erie, Secretary, and **Clifford Zipf,** Pittsburgh, Treasurer. **Frederick Monsees,** Lynbrook, N. Y., was in charge of the installation of new officers.

The eleventh annual meeting of the **Illinois Wing** was held May 20 at the White Pines Country Club in Bensenville, Ill. **William Mathieson,** Commander of the Wing, had a very effective convention committee, composed of **Lee Cordell,** a member of AFA's Board of Directors, **Lucille Zischke, Leonard Luka,** and **William Farina.**

Dr. K. Richard Johnson, President of the National Aviation Education Association, was principal speaker at the annual banquet, which was highlighted by the presentation of the Wing Airpower Awards. **Norman Ross,** well known Chicago television and newspaper commentator; **Kevin Brown,** Aviation Editor of *Popular Mechanics* magazine; and **Col. James Sheridan,** Director of the Chicago Office of Information, USAF, were honored by the Wing for their contributions during the past year.

Mathieson, a Chicago attorney, was reelected Wing Commander to serve with **Luka,** Vice Commander; **Miss Zischke,** Secretary; **Farina,** who was selected as Treasurer; and **Harold G. "Kit" Carson,** chosen for another term as Wing Organization Director.

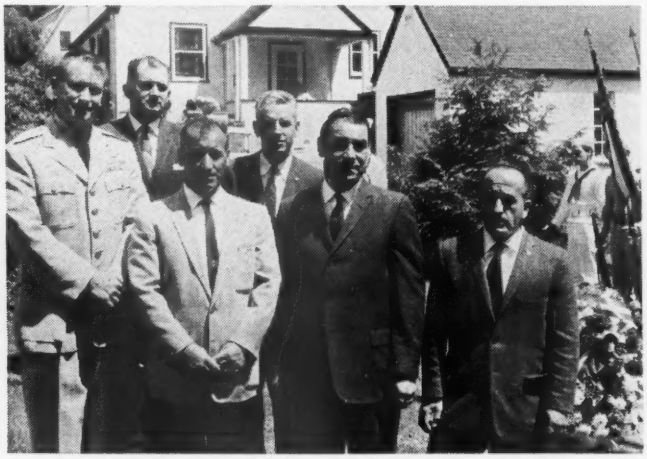
Using AFA's Fifteenth Anniversary as the central theme of the awards banquet, the **Michigan Wing** held its annual meeting at Selfridge AFB, Mt. Clemens, with Wing Commander **Robert G. Saltsman** in charge.

Guest speaker for the glittering banquet was **Lt. Gen. Francis H. Griswold,** Vice Commander of the Strategic Air Command (*see cut*). Honored guests at the banquet included **Ed Cole,** General Manager of Chevrolet Company; **Jack Reese,** President, Continental Motors Corporation; and **Dr. Talbert Abrams,** President, Abrams Aerial Survey Corporation.

Sherrod E. Skinner, Executive Vice President, General Motors Corp., was named by the Wing to receive the **1961 Airability Award,** in recognition of his contributions **advancing aerospace technology** and his support of AFA.

Industrial hosts for the dinner were the **Bendix Corp., Burroughs Corp., Chrysler Corp., Continental Motors, Defense Systems Division of General Motors Corp., and Ford Motor Co.,** all of which were represented by top executives at the speaker's table.

USAF's Lt. Col. Marjorie Hunt was the winner of the 1960 Michigan Wing Airability Award but was unable to be present to accept, so Wing Commander Bob Saltsman presented it at the 1961 Wing meeting. They are shown above with guest speaker for the program, Lt. Gen. Francis Griswold.



New Jersey's Passaic-Bergen Squadron recently dedicated a memorial to World War II and Korean dead. Shown are National Director Don Strait, guest speaker, and Squadron officials Ted Sorg, Vincent Ruggerio, John Thievon, Peter Restivo, and Squadron Commander Italo Quinto.

° ° °

CROSS COUNTRY . . . . Little Rock, Ark., Squadron paid tribute to the **USAF Thunderbirds** at a luncheon May 16, when the famous team came to town to demonstrate their skills during an Armed Forces Week program. All the 'Birds were made honorary citizens of Little Rock . . . . **Brig. Gen. Ray S. Miller,** USAF (Ret.) died in St. Paul, Minn., May 31. We join his many friends in expressing our sorrow to his family. General Miller, after whom **AFA's St. Paul Squadron** was named, is often called the "Father of the Air National Guard." . . . **Battle Creek, Mich., Squadron** plans a huge international air show for August 6 at Kellogg Field.

In the June '61 issue of "AFA News" we **erroneously stated** that **Janet Austin, Lucille Redtfeldt, and Ernestine Sullivan** were members of the **San Fernando Auxiliary Unit.** We couldn't be more wrong; all of them belong to the **Covina Valley Unit.** Sorry, girls.

—Gus Duda

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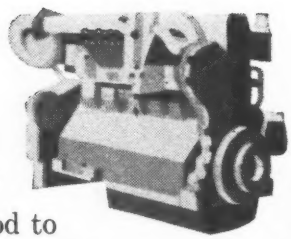

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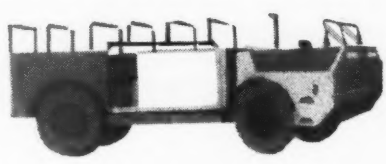

airman's bookshelf

Long Arm of Airpower

***Air Bombardment: The Story of Its Development*, by Air Marshal Sir Robert Saundby (Harper & Brothers, 1961, 288 pp., $5).**

Reviewed by Alfred Goldberg

Old British soldiers never die; they become writers. And many of them write interestingly and well. Air Marshal Sir Robert Saundby, a major figure in the Royal Air Force for many years, has joined the writing ranks with this brief, concise account of the development of air bombardment.

This book reflects the author's origin, for it is primarily an account of British experience in air bombardment through the years. The United States comes in for a modest share of attention, but there is very little about the experience of other countries—Germany, Russia, Japan, France, Italy—except insofar as they were foils of the British and Americans during the second World War.

World War I is treated briefly. More on the origins of strategic bombardment in 1917-18 would have provided a stronger framework for the book. Almost sixty percent of the book is devoted to World War II. About a quarter of this section deals with the American strategic-bombing effort; most of the rest is the British experience. Curiously, the author devotes a disproportionate amount of space to the RAF's efforts against German surface vessels.

Saundby is concerned primarily with the experience of bombardment, with the result that theory, doctrine, strategy, and tactics are inadequately treated. The great controversies over strategic bombardment that raged during and after World War II are touched on, but they are not considered in the depth they should be. The implications of the issues raised by strategic bombardment had the widest repercussions, not only military but political, economic, and moral.

The military implication (which can hardly be separated from the political and economic, and even the moral issue was raised by the US Navy only a dozen years ago) is simply that the strategic planning and thinking of the US and British military services in the postwar years have been profoundly influenced by their interpretations of strategic bombardment in World War II. At the root of most of the major controversies among the services has been the validity of the concept of strategic bombardment as the cornerstone of national military security. The services have disagreed profoundly on the meaning of the World War II experience and its application to planning since 1945.

There is still no definitive analysis of the value of strategic bombardment in World War II. The massive reporting feats of the US Strategic Bombing Survey (USSBS) and its British counterpart did not extend to the kind of analysis required for an evaluation. The statement by USSBS that "Allied airpower was decisive in the war in Western Europe" did not answer the fundamental questions about the role of *strategic* airpower. Did strategic bombardment make a big enough contribution to the winning of the war to justify the resources devoted to it? Could it have made a bigger contribution had more resources been devoted to it? These are the questions that must be explored and analyzed in detail and answered as positively as the evidence will permit.

Saundby has addressed himself to this question and he is certain of the answer. But the brief treatment will hardly convince his friends, let alone his opponents. And these opponents are a formidable lot even though their denunciations of the theory and practice of strategic bombardment are distinguished by a disregard of the facts and figures. Saundby makes some telling points against the interpretations of such military analysts as Walter Millis and Sir John F. C. Fuller and the scientist-writer Sir Charles P. Snow, but it is impossible to develop a convincing case in only a few pages.

Saundby has touched on another theme that has manifested itself profoundly in the postwar period. The role of the scientist in military affairs has become dramatically apparent to all since World War II, but this book demonstrates clearly the indispensable contribution of science to the success of British arms in World War II. The role of the scientists in relation to government in both war and peace has become one of the most profound problems of our time.

Air Marshal Saundby has written an interesting brief survey of primarily British experience in the development of air bombardment. One wishes it were longer and in some regards more extensive. Much of what is present, however, is well written and well worth reading. The book merits the attention of students of air warfare.

ABOUT THE REVIEWER: *Dr. Goldberg is Chief of the USAF Historical Division and editor of* A History of the United States Air Force, 1907-1957, *published by* AIR FORCE *Magazine in 1957.*

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Snapper's Last

***Sabres over Brandywine*, by Lt. Col. David F. "Snapper" McCallister, ANG, and Lindy Boyes (Hesperian House, San Francisco, 1961, 243 pp., $3.95).**

Reviewed by Richard M. Skinner
Managing Editor, Air Force/Space Digest

The night of June 4, 1961, Air Guard pilot Dave McCallister's T-33 lost power on takeoff from Scott AFB, Ill., and crashed, killing "Snapper" and seriously injuring his passenger, ANG Brig. Gen. William Spruance (*see "Ready Room," July '61* AIR FORCE). One month later Snapper's first—and, regrettably, last—novel appeared. The book was written with Powder Puff Derby veteran and aviation writer Lindy Boyes, a member of the Ninety-Nines, international organization of women pilots.

All of us who knew and mourn Snapper know how enthusiastically proud he would have been of his book. And there is much in *Sabres over Brandywine* to take pride in.

The novel concerns the problems of Air Guard F-86 pilot Capt. Rix Carlsen during the final days of his outfit's twenty-one-month recall to active duty during the Korean War. Carlsen, a World War II fighter pilot, is now a flight leader in a Guard air-defense squadron, based at Brandywine AFB, near Philadelphia. When he returns to civilian life in a month, Carl-

(Continued on following page)

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AIRMAN'S BOOKSHELF — CONTINUED

sen plans to resume direction of his family-owned contracting business. The business is seriously threatened by the machinations of labor racketeer Mike Quinn, who heads the "Pennsylvania Confederation of Labor" and is determined to organize Rix's firm.

But this is not the least of Carlsen's problems. He is unloved by his rich, spoiled, emotionally immature wife; their three young children are all that hold the marriage together. Carlsen then innocently meets and believes himself in love with Sue Ann "Suwannee" Kane, glamorous and understanding widow of a World War II ace who was shot down in Korea. The wicked Mike Quinn seizes on a chance event to smear Carlsen and Suwannee in his labor-controlled newspaper in an effort to "bring little boy blue around."

And in addition, at the fighter base, Rix and his squadron mates are beset by an ambitious and self-seeking commander who drives his flyers and maintenance men mercilessly in a vain attempt to gain a top EADF rating for the unit and thus win his eagles.

The plot and all the subplots bubble and thicken like gravy for 238 pages, and in the final five everything works out just fine—the martinet commander gets his come-uppance; the Flying Evaluation Board won't meet after all to take Rix's wings; Mike Quinn and his henchmen are exposed by honest labor leaders; the newspaper smear campaign is disavowed; Suwannee nobly convinces Rix that his place is at home where a reconciliation is made possible after Rix's son Timmy is seriously hurt in an automobile accident and Rix and his wife, Lila, tensely wait out Timmy's crisis together—and then go home to what we know is a new life.

This, of course, is jet-age soap opera. Carlsen himself says it, as he and Suwannee tool down Webb Road in Rix's car after eluding sensation-seeking labor-paper reporters: "Just like in a Class-B movie."

Still, *Sabres over Brandywine* would make a good movie. We learn a good bit about Rix's Eighth Air Force career and his experiences in Korea through flashbacks. The flying episodes—both old and new—are well done and are, in fact, with the deft and effective use of flying jargon, the best part of the book.

There are some first-rate characterizations, some possibly fictional but others clearly drawn from real life. One of these is Lt. Ted Brogan, the group information officer, who refreshingly down to his toes is Ed Hogan, veteran aviation writer and PR man, formerly AFA Reserve Affairs Director, and now with General Electric in Cincinnati.

But the best drawn character is Maj. Henry H. "Sonic" Boomer, Eighth Air Force ace who also bagged nine MIGs in Korea, where he was Rix's operations officer. He and Rix meet in Los Angeles where both are to pick up modified F-86s from the North American plant. Sonic's greeting to Rix gives you an idea: "Hey, Papa-san! What's the rice paddie daddy doing in the land of the Big PX? . . . Give me a few inputs. Dig me with a gamma photon countermeasure."

It is supremely ironic that Sonic loses power on takeoff and goes straight in from 200 feet—the same sort of accident that took author McCallister's life. Rix's reaction is perhaps prophetic: "For a half-hour he walked up and down the ramp thinking the whole thing out. Hadn't it always been this way? Weren't guys like Sonic always buying the farm? Good pilots, real tigers with tons of experience getting trapped in that one fatal minute after takeoff. . . . But why? Why did Sonic just happen to catch that G.E. time bomb with the short fuse? What about the other Sabre? Was it, too, a time bomb with a short fuse? He stared at the metal-winged machine sitting on the ramp, no longer beautiful, now a monster, a beast, a killer of men who gambled their lives every time they stepped into one."—END

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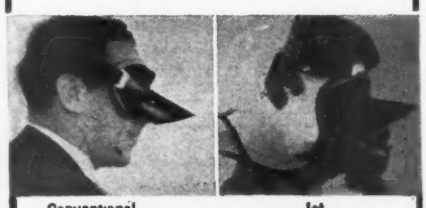

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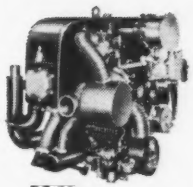
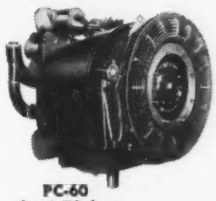
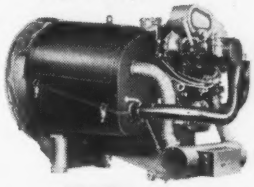


PC-30
2-cyl. 34 hp.

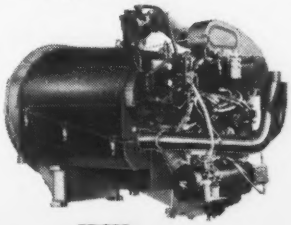


PC-60
4-cyl. 70 h.p.

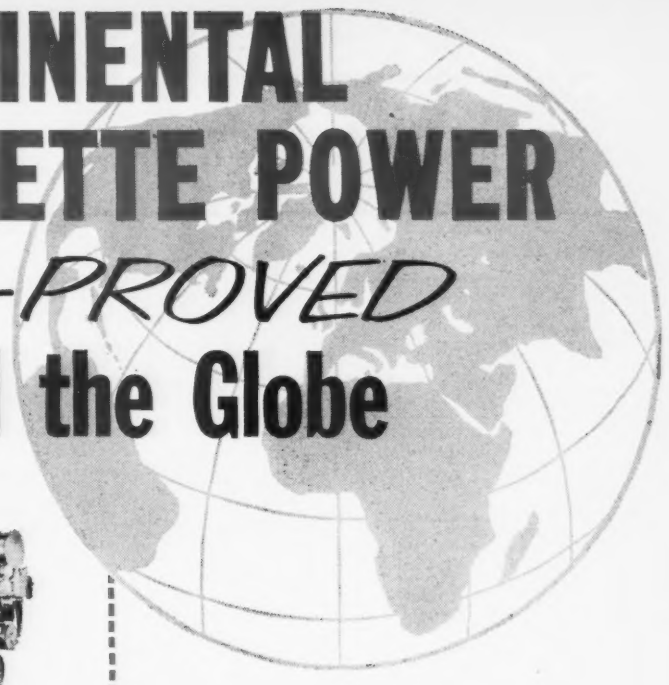
PE-90
4-cyl. 110 hp.



PE-150
6-cyl. 175 hp.



PE-200
8-cyl. 250 hp.



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